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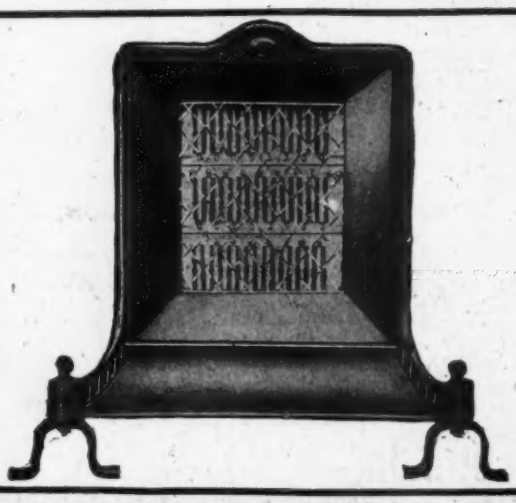

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OVERSEAS ENGINEERING TRADE.

As we foretold in a recent issue, the meeting of the Institution of Electrical Engineers at which Mr. Andrews's paper on "The Overseas Distribution of Engineering Appliances" was read and discussed was one of the most interesting and successful of the session. The author quickly read an abstract of his paper, and for over an hour and a half there was no slackening in the discussion, though, with the privileged exception of the first speaker, no one exceeded the time allowance of five minutes. The fact that so many of the speakers commenced by cordially congratulating the Institution on the reading of a paper dealing with a commercial question of the first importance—endorsing our own remarks of a fortnight ago—was highly significant, and we have no doubt that the Council will take due note of it.

While many divergent views were expressed in the course of the debate, on certain points there was a degree of unanimity which could not fail to impress the hearer. Chief of these was the subject of "State Control." It was made abundantly clear that the very name was anathema to the members, and that any scheme which involved the exercise of State control would stand condemned without trial on that account. The author had handled this subject very warily, setting forth the pros and cons, and in his conclusions he definitely rejected State control of industry "upon German lines," substituting for it "State service" on lines analogous to the postal service; but the discussion indicated that manufacturers would regard any form of State intervention with a very jealous eye, and that even the postal "service" was not immune from suspicion as a medium for despotic, though veiled, control by the State.

Secondly, there could be no doubt that the meeting almost unanimously approved, and even demanded, collective action, at any rate in connection with the overseas distribution of engineering goods; the position with regard to co-operation in production was not quite so clear, but certainly the consensus of opinion was generally in favour of it, and several speakers emphasised the necessity of reducing competition between manufacturers in similar lines by the adoption of a measure of co-ordination or specialisation within specified limits. Only by such means, it was urged, would it be possible for British manufacturers to cope with the gigantic organisations which have their roots in Germany and the United States, and of which the ramifications embrace the whole world—actually, as in the case of the former, or potentially, as in the case of the latter.

Another factor in the problem which received a good deal of attention was the question of the middle-man, whose popularity appeared to be a minus quantity; in this connection much criticism was directed at the intermediary "Board of Control" outlined by the author, and there was a decided disposition to "short-circuit" this body by direct communication between the producing and distributing organisations.

But all these questions are subordinate to what, in our opinion, was the real, solid outcome of the meeting—namely, the general feeling that the time for talking was past, and that the time had come for action. No one can tell when the war will end, but of one thing there can be no question—that there is not a day to spare in making and perfecting our preparations for the new peace conditions; not the

return of peace conditions, for the old *régime* has gone for ever, and we shall face a new world. As Mr. Williams remarked, when peace returns "business as usual" will not serve; we must devise new methods and lay new plans in readiness for the industrial struggle which will then commence. Hence the question of the hour is what step shall be taken to bring the matter to a head, and to institute immediate action. Only one practical proposal to this end was put forward, namely, that of Capt. Slacke, that the Councils of the three great engineering Institutions should jointly approach the Overseas Trade Advisory Committee, the personnel of which had been announced on the same day, and secure its support; it is obvious that, apart from any question of "control" or "service," the cordial support of the Government is indispensable to the successful inauguration of any national scheme of the kind under discussion. If such combined action can be arranged, there can be no doubt that it will carry great weight with the Department of Overseas Trade, and its effect would be greatly increased by the co-operation of the B.E.A.M.A., whose sympathy may safely be relied upon, as well as representatives of other important bodies interested in the engineering industries. Any such movement must have a beginning, and the initial impetus might well be furnished by the appointment of a small committee by the Council of the I.E.E., to carry out the preliminary negotiations and arrangements with a view to the early formation of a widely representative committee charged with the duty of formulating a suitable constitution for the proposed organisation and securing its creation.

Granted that, as the meeting made manifest, some system of organised co-operative selling in oversea markets is essential to the development of the engineering export trade, and that such system, as the discussion also demonstrated, must be entirely free from State control, the question arises: What form should be given to the central organisation, which is obviously necessary to co-ordinate the efforts of the manufacturers and to satisfy the requirements of both producers and consumers? Several alternatives present themselves, besides the system at present mainly in vogue—namely, direct representation abroad by the manufacturing firm itself. In the absence of State intervention, this system will of necessity always remain open to all firms that are large enough, strong enough, and adequately equipped with a capable staff to undertake the wide range of duties involved; but obviously it will remain difficult as at present for any individual firm to secure adequate representation all over the world, and being outside the national organisation it will not enjoy the advantages derived from co-operative effort. Groups of manufacturers, none of whom is in direct competition with his associates, may be formed, and, in fact, have been formed on various occasions, with varying degrees of success or failure; such groups, however, are still liable to meet with competition from other similar groups or from independent manufacturers, and also suffer in joint tendering from the fact that one or other of the component firms may be too busily engaged in other directions to be able or willing to quote a close price, with the result that orders that might have benefited the whole group are placed elsewhere. On the other hand, groups of manufacturers in the same line of business may be formed, and here a full measure of co-operation can be realised, together with the widest representation, comparative freedom from home competition, and facilities for co-ordinated specialisation. The best example of such a combination is the Cable-Makers' Association, which since its formation, some 20 years ago, has been remarkably successful, and has benefited both its own members and its customers, besides raising the standard of quality of British cables to a pitch of unrivalled excellence. We believe that this Association has from time to time contemplated the establishment of a co-operative selling organisation to deal with oversea trade, but unfortunately individual manufacturers have been unwilling to pool the trading connections which they have built up for themselves in certain territories, for the benefit of the Association as a whole, although they fully appreciate the advantages that would accrue to all the members from this course. It may be suggested that if an existing Association of such a type has failed to agree upon a co-operative scheme, there is little prospect of agreement between all the engineering trades; but we may again point out that entirely new conditions will prevail in the future. All parties have realised the imperative necessity of collective action and community of interests, and should be willing to subordinate their predilections to the common good, in which they will share.

At the moment the proposal of Mr. Andrews to form a single central body charged with the duty of co-ordinating the activities of the manufacturers and developing a comprehensive organisation for the disposal of their products throughout the world holds the field; apart from the absolute rejection of State control, the details of the scheme are of no immediate concern—they remain to be considered by the proposed committee. But one factor of the first importance demands attention—the method of financing the projected organisation. The author proposed that the assistance of the State should be invoked, in order to cover operating expenses, but mainly to provide for the maintenance of adequate stocks in every overseas centre, without which it is impossible to carry on any considerable trade in standard engineering supplies. But direct assistance from the State is liable to result in a measure of State control, which would not be acceptable to the industry.

In private discussion on the matter, a well-known electrical engineer has suggested an alternative method of finance which is worthy of careful consideration. His proposal is that a very large number of leading British manufacturers of all types of engineering products shall guarantee the interest, and repayment by sinking fund, of any capital subscribed for this purpose. The actual funds might be raised by public subscription for State bonds, but as the manufacturers would be solely responsible for the fund, there would be no question of interference by the State, which would be in the position of a bank lending money to a trading concern. The very large number of guarantors would ensure absolute security, while naturally business would only be placed with manufacturers who were guarantors to the co-operative scheme. We understand that the author regards this suggestion as in every respect better than his own proposal for financing the scheme, and as being free from the many apparent objections to other suggested schemes. But having in view the unimpeachable security, would it not be possible to go direct to the public for the money?

Here we must leave the matter for the moment; but we may be excused for expressing our extreme gratification at the cordial reception accorded to the proposal for the adoption of co-operative methods in connection with our export engineering trade. For many years past, and especially since the outbreak of war, we have constantly pressed upon our readers the urgent necessity of co-operation in order to cope with foreign competition on the one hand, and to reduce the excessive competition between our own people on the other. We will not labour the point—suffice it for us to draw attention to the appended extracts selected from the many articles on this subject that we have published as justification for our pleasure at seeing the policy which we have championed at last, apparently, endorsed by the industry, and in a fair way to be carried into effect.

OUR POLICY ON OVERSEAS TRADE.

We are not in the habit of reproducing extracts from our past volumes, but we make a departure from our custom this week. The important paper and discussion at the Institution of Electrical Engineers last week seem to justify the reprinting of a few of our war-time comments on the subject of co-operation for overseas trade. We believe that the Review's policy is known to most electrical business men, but possibly some who have been too busy to read will care to peruse the following remarks, which are typical of many published both before the outbreak of war and consistently during its progress down to date:—

Co-operation in Trade Expansion.—In the absence of any definite information regarding associated efforts that may be on foot for beginning or extending electrical trading operations . . . . we place ourselves at the service of British electrical manufacturers. Somebody must take the initiative in matters of this kind . . . we can proceed to deliberate seriously, perhaps prepare a plan of campaign, and gather together the necessary forces ready for definite operations to begin at the psychological moment. . . . In co-operation many things are possible that individuals cannot do alone. . . . A dozen or so manufacturers of different classes of machinery or goods might collectively, by one or two efficient representatives sent to each market, study the whole of these markets simultaneously . . . . or they might send a stronger representation to study each in turn. . . . We talk of "capturing trade—let us not be less ready in our trade callings, than our legislators in theirs, to follow up our talking with action. We urge our readers to prepare themselves for carrying the electrical trade war into the countries we have named by beginning to organise their forces straight away. . . . We shall be pleased to do whatever we can to bring together those who desire to consider the taking of joint action, and if our preliminary measures succeed, to leave the matter for those directly concerned to develop fully along their own lines."—Elec. Rev., September 25th, 1914, p. 419.

Co-operation in Trade Expansion.—The willingness on the part of several firms to consider the matter in conference should induce others to take advantage of that frame of mind while it exists. In our view it is not too early for business like deliberations to take place, so that suitable preparations may be made in good time. Indeed, information has reached our ears of magnificent engineering contracts that have lately been booked in a market which our firms have long desired to enter, the contracts referred to having been secured because of a policy of concerted action arranged some time ago by a number of firms. This success alone, coming during war time, suggests that there need be no delay in taking definite measures.—Elec. Rev., October 2nd, 1914, p. 451.

Reconnoitring.—We are not suggesting that British electrical manufacturers are asleep or that they have done nothing. Our post-bag and our conversation with men have told us differently. Here and there individual firms are considering their own personal relation to the position: how they can in their works make this or that new line, or what prospects their particular make of article would have in a new market, and how to get it known there. But there is a danger of their losing heart, *because of the inevitable weakness of individual policy and isolated action.* They could so much more readily and more hopefully consider the difficulties and the prospects, and the financial and technical problems involved if they could only put their heads together. There is a desire on the part of some to act in co-operation, or, at any rate, to study matters in a preliminary way in conference, and we trust as the weeks pass by this disposition may grow, and something useful may be done. We should like to recommend that a public meeting of the electrical industry be summoned at which the position shall be laid before us all by an authority, and discussed seriously and in detail, and without feelings of undue reserve and suspicion.—Elec. Rev., October 16th, 1914, p. 514.

Co-operation.—It may be that other co-operative electrical schemes have lapsed because it is but human that many members of the body corporate should have widely divergent interests, and that co-operation can only be harmoniously conducted when it limits itself to those matters where it can conduce to the good of the whole, and is ruthlessly harsh or unfair to none. . . . As a business people we ought to be co-operating in connection with the supersession of German export trade. . . . There is a general trade co-operation proposition, such as we have recently advocated, which is not too ambitious, and which ought to be carried into effect just as soon as ever possible. We have urged electrical and allied manufacturing firms who are unable alone to tackle the new markets and the new lines of manufactures to put their heads together for these express purposes, and there is a disposition on the part of a number of them to do so. We would that they were more numerous and more enthusiastic. . . . If the Board of Trade cannot undertake specialised investigations of this character, then perhaps our own electrical organisation can do it by a co-operative effort of the manufacturers. . . . It is perfectly true that individual firms have divergent interests, but is it impracticable for them to make some grand united effort at this exceptional time, in order that advantage may be taken of the prevailing opportunity? Certainly that blessed word Co-operation, with which we have opened this article, seems to call for reiteration at the end of it, for it can only be by co-operative effort on very broad lines that we can secure what awaits us.—Elec. Rev., November 20th, 1914, p. 677.

Our Future.—As we have referred to the necessity for the guidance that comes from big men and from experienced experts, we may be permitted to bring these notes to a conclusion by divulging a conversation that we had with a most estimable German gentleman of wide experience several years ago. Mr. J. Stöttner, who, we believe, built up the great business of the Electrical Co., Ltd., in these islands from the very smallest beginnings, and was responsible for the placing of millions of pounds' worth of contracts with the Allgemeine Electricitäts Gesellschaft, in Berlin, was discussing with us shortly before his death the position of the electrical industry in this country. . . . Mr. Stöttner was no longer the representative of the concern to which for years he had devoted himself heart and soul. He appeared to speak with all sincerity, and what he said carried conviction. He deprecated our scattered and entangled manufacturing operations; decried the habit of attempting to manufacture "everything electrical" in a comparatively small factory; advocated the closing or else the complete reorganisation of many of our small factories, which he considered could not hope to manufacture competitively when they devoted themselves to scores and hundreds of more or less dissimilar productions; he would, by a process of arrangement between different firms or companies, concentrate the manufacture of particular lines of machinery or apparatus in specialised factories run on a large scale, in several selected districts—motors here, switchgear there, engines and turbines somewhere else, and so on. This, in brief, was the course advocated by Mr. Stöttner, who knew the reasons for German success in Germany, and for his own success as a competitor here. He positively affirmed that if Britain, as an electrical manufacturing country, was ever to stand up effectively against Germany there was no other way in which it was to be brough about. . . . Since that date we have witnessed the carrying out of the idea on a small scale in connection with some sections of the industry in England, and it has been our privilege to visit works whose owners have had reason for feeling gratified with the measure of success which had attended their efforts at more or less strict specialisation. At times the best concerted schemes "gang aft a-gley," and the many interests requiring reconciliation, and needing to be called upon to make sacrifices and effect compromises, make Mr. Stöttner's proposition one of great complexity and difficulty, but we do not consider that any time spent considering such questions can be wasted in view of the vast changes that lie ahead internationally.—Elec. Rev., July 9th, 1915, p. 37.

The Balfour Report on Trade Organisation and Foreign Competition.—We are unable this week to refer fully to the four reports of Lord Balfour's Committee on Commercial and Industrial Policy After the War, but in view of the discussion at the Institution of Electrical Engineers last week, we may state that consideration of the subject of industrial and commercial organisation brings from the Committee strong recommendations in favour of closer combination among traders as a means of meeting increasing foreign competition. While there is a danger that such combination may not only tend to diminish the individual enterprise to which the progress of British manufacture and industry has been largely due, but may also be carried to a point at which it becomes detrimental to the general interest of the country, they agreed that in some important directions the individualistic methods hitherto adopted should be supplemented or entirely replaced by co-operation in respect of (1) the securing of supplies of materials, (2) production, including standardisation and scientific and industrial research, and (3) marketing. It is very desirable they think that in all important British industries there should exist strong, comprehensive, and well-organised associations which should be clearing-houses of information of common interest, competent to voice the opinion and needs of their respective trades as a whole. Every encouragement should be given by the Government to the formation of combinations of manufacturers and others concerned with securing supplies and materials. In regard to production, the Committee think that the constructive action must come from the industries themselves. While the Committee do not think it would be expedient for the Government to aim at positive control of trade combinations, they think that some means should be devised for securing to a responsible Government Department adequate information as to their formation, with provision for State investigation in special cases. They also think that combinations should be legalised so as to be enforceable between members, provided that they are registered at the Board of Trade, which should have power to call for information as to their operations. In the case of international combinations to which British firms are parties compulsory registration is recommended.

LARGE STEAM TURBINES.

[COMMUNICATED.]

There is little doubt that sooner or later turbines that are considerably larger and more economical than those at present in use will be installed in power stations in this country. The advantages of large generating sets in stations erected on roomy and efficient sites are pretty generally recognised. Turbo-generators having capacities in the neighbourhood of 20,000 KW. are economical in steam consumption; the first cost per KW. is low, and, compared with other prime movers and turbines of smaller outputs, the floor space required for each KW. installed is a remarkably small quantity. A 20,000-KW. set does not, of course take up anything like 10 times as much space as a 2,000-KW. set, and when we compare the space occupied by 20,000-KW. and by 200-KW. machines, the discrepancy becomes much more marked. Similarly, in respect of labour it is evident, having regard to the fact that a turbine is self-lubricating, that a 20,000-KW. set will not require very much more attention than a set that is considerably smaller. These advantages, coupled with the fact that the large units have a lower steam consumption than those of smaller capacities, render their use desirable in connection with the economical generation of electricity. In the report recently issued by the Coal Conservation Sub-Committee it is proposed to install in the national power houses sets having outputs of not less than 20,000 KW., and it is considered that in the most important industrial districts machines of 50,000 KW. might be used.

Generating sets of such capacities have not, as yet, been put into operation in Great Britain, although a 25,000-KW. machine was built some time back by Messrs. C. A. Parsons for the Fisk Street station of the Commonwealth Edison Co., U.S.A., the order, it is said, having come to this country mainly by reason of the superior steam economy guaranteed. The consumption guaranteed was exceptionally low. With steam at an initial pressure of 200 lb. per sq. in., superheated to 200° F. and with an absolute pressure in the condenser equivalent to 1 in., the turbine was to have, when working at 20,000 KW., a consumption of not more than 11·25 lb. per unit. At 25 per cent. over or under load the consumption per unit was not to exceed 11·65 lb., and at half load 12·5 lb. The penalty for any excess above 12·25 lb. at 20,000 KW. was £500 for each one-fifth of a pound, but improvements were to be rewarded by a bonus of equal rate. The guaranteed steam consumption is equal to 8·1 lb. per shaft horse-power, a result that has not hitherto been attained in marine practice. Turbine steam consumptions have steadily been reduced, owing partly to the increase in size and partly to modifications in design as the result of experience. Between the years 1906 and 1911 there was marked progress in this direction. During this period the steam consumption per KW.-hour was reduced from 12·75 lb. to 11·6 lb., and the total efficiency—*i.e.*, the actual output of generator divided by the mechanical equivalent of heat drop according to adiabatic expansion—was raised from 63·8 per cent. in 1906 to 66·3 per cent. in 1907 and to 68·4 in 1910, these figures relating to turbines of moderate outputs.

The 20,000- and 30,000-KW. turbines that have so far been built are constructed on rather different lines to smaller turbines, such as those at present in operation in this country. They consist of high- and low-pressure units, and, in the case of the Parsons machine built for the Commonwealth Electric Co., these two units are arranged in tandem and are mechanically coupled. The low-pressure turbine is of the double-flow type, the steam from the high-pressure element entering at the centre and passing to the right and left through successive stages of expansion, exhausting at both ends and then flowing to the condenser, which has a cooling surface of 39,000 sq. ft. Apart from the fact, however, that the steam is utilised in two separate cylinders, high and low pressure, each developing the same horse-power, and that the low-pressure element is of the double-flow type, this machine is built on more or less standard lines. The high-pressure turbine is of the single-flow parallel type, the end pressure being balanced by three dummy pistons of standard design. In accordance with the practice which has now been adopted by Messrs. C. A. Parsons for some years, and with very beneficial results, the tips of the blades are thinned, so that in the event of the rotor touching the interior of the casing, which it is apt to do in the event of the casing being distorted, the blades do not suffer material damage. Before this practice of thinning the blades was adopted, blade stripping in reaction turbines, which must, of course, have fine radial clearances, was not altogether an uncommon occurrence, but by thinning the blade tips this trouble has been greatly reduced. The blades in that portion of the turbine that is subjected to the high temperature of the superheated steam are of copper.

In American power houses, where turbines of large capacity have been installed, the saving in floor space has been very considerable, and especially where these sets have replaced reciprocating engines. A case in point is furnished by the Seventy-Fourth Street station of the Interborough Rapid Transit Co., in which in the year 1915 four reciprocating engines, having an aggregate capacity of 28,000 KW., were replaced by three 30,000-KW. turbine sets giving an aggregate capacity of 90,000 KW. with the same floor space. These turbines, which are Westinghouse machines, work at a steam pressure of 200 lb. per sq. in., a vacuum of 29 in., and a superheat of 120° F. The most economical load is 25,000 KW., at which the steam consumption is said to be 11·27 lb. per unit. The reciprocating sets worked at a pressure of 150 lb. per sq. in. and a vacuum of 25 in., and consumed 17·3 lb. of steam per KW.-hour. Hence the steam consumption of the turbine is only approximately 65 per cent. of that of the reciprocating engines, each consumption being taken at the point of best efficiency. If the three turbines were operated three-fourths of the time at 25,000 KW. (the output at which the machines are most efficient) the saving in fuel alone for each unit would amount to over £40,000 per annum, based on coal at 15s. per ton, and an average evaporation of 8·7 lb. of water per lb. of coal. These turbines also have two cylinders, high- and low-pressure, but, unlike the Parsons machine supplied to the Commonwealth Edison Co., each element drives a separate alternator operating at the most desirable speed for the corresponding turbine cylinder. Clearly the cost of a unit built upon these lines is greater than that of one with only one alternator, or a turbine in which the steam expands in a single cylinder, but with machines of this size the two-cylinder arrangement is necessary to obtain the best economy. Although all these large reaction turbines have two separate cylinders, the same governor and oil pump will serve for both parts of the machine. The governor dealing with the steam at boiler pressure controls the speed of both elements, and gives variable back pressure at the high-pressure end and the best efficiency at all intermediate loads, as well as the load for which the machine is mainly intended.

At first it may appear that this practice of using two alternators, one for each cylinder, necessitates coupling each machine to the station bus-bars separately; but this is not the case. The two alternators are permanently connected together with cables, and are synchronised as a single set, and when the machine is switched on to the bus-bars the low-pressure element carries all the load it is able to carry with the steam it receives from the high-pressure element. When starting the set the fields of both generators are energised, and when steam is admitted to the machine and the rotors begin to revolve, they build up their voltages and pull into step. At the maximum output the two elements share the load equally, but at intermediate loads the high-pressure portion carries slightly heavier loads than the low-pressure portion. At a load of 30,000 KW. the steam pressure at the low-pressure inlet is 18 lb. absolute, at 25,000 KW. 14 lb., and at 16,000 KW. 10 lb. The double-flow arrangement, though abandoned on turbines of such capacities as those operating at the present time in this country, offers marked advantages on the low-pressure portion of machines such as those under consideration. It eliminates all end pressure, and gives ample blade area for the large volumes of steam that have to be dealt with.

Naturally, turbo-generators of this size require a very large volume of air to cool them, and the idea of utilising the discharged air at increased temperature for the boiler draught seems to demand special consideration with such

large sets. The scheme has been adopted in the Seventy-Fourth Street station of the Interborough Rapid Transit Co., and it can, of course, be adopted in other large stations with equal advantage. Although it appears at first sight that the plan of dividing these large generating sets into two units, high- and low-pressure, is an expensive procedure which ought to be avoided, experience shows that the policy is a sound one, for the turbine designer may adopt proportions conducive to economy without being restricted by mechanical limitations. That an economical 25,000-kw., 25-cycle set can be built with only one alternator is evident from the fact that the Parsons machine built for the Commonwealth Edison Co. is constructed on these lines. The speed in this case is 750 r.p.m., but in the case of the Westinghouse sets erected in the Seventy-Fourth Street station of the Interborough Rapid Transit Co., which are also 25-cycle machines, the speed of the high-pressure rotor is 1,500 r.p.m., whilst the low-pressure rotor runs at half this speed, and the numbers of poles on the two alternators differ accordingly. Naturally, the high-pressure element is considerably smaller than the low-pressure one, and the double-alternator arrangement enables half the set to be run separately in case of emergency.

JOINTS ON TRIPLE-CONCENTRIC TO THREE-CORE LEAD-COVERED CABLES.

By P. WARDLE, Carlisle Electricity Works.

The writer, in submitting the following article for publication, hopes that it will be of interest to those mains engineers who are responsible for the maintenance and repair of d.c. three-wire distributing networks, where the original distributors laid down consist of triple-concentric, lead-covered and armoured cables laid direct, but which, during the last few years, have been, and are being, discarded in favour of three-core, paper-insulated, lead-covered and armoured cables, laid direct.

However, it so happens, as in the writer's experience, that in some towns there may be several miles of this class of distributor, of which, for many reasons, the renewals cannot be carried out all at once, but, on the other hand, may have to extend over a period of years. Again, some of these distributors have been laid anything from 15 to 20 years, and although the condition of the cable may be good considering the circumstances, faults invariably develop at the glands of both service and straight-through joint-boxes, and so damage the cable that a new piece has to be spliced in.

It may also be found necessary to extend an existing T.C. distributor when only three-core cable is available, and the usual practice is to use a straight-through c.i. joint-box.

As is well known, the standard practice now adopted in jointing three-core cables is to enclose the joint in a plumbed lead sleeve, and it is the writer's endeavour to apply this to T.C. cables wherever possible.

The chief difficulty previously experienced in making a T.C. to three-core sleeve joint has been that the necessary fittings have been too bulky, and would not allow a reasonable-sized sleeve to fit over them. This has now been overcome by the writer, and, on referring to fig. 1, there will be seen a T.C. to three-core joint, on a T.C. ·12, ·06, ·12 to three-core ·12, ·075, ·12 distributor, with the finished joint shown on the right of the figure.

Fig. 2.—Three-core Service Joint Inserted in Triple-concentric Cable.

The distance across the outside edges of the fittings, which are fixed diametrically opposite, is 3 in., and the lead sleeve has an internal diameter of 4 in.

Fig. 2 shows two similar joints on the same size of distributor with a three-core service joint in plumbed sleeve in the centre. Originally the service joint was enclosed in a cast-iron box with porcelain bushes, but owing to a short-circuit fault in the gland of the box, rendering the T.C. distributor at that point unfit for further use, it was necessary to splice in a new piece of three-core cable.

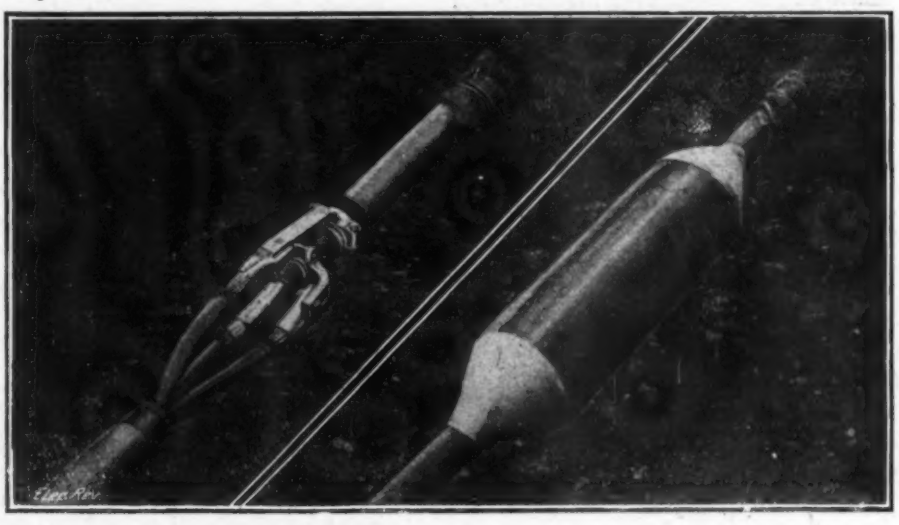


Fig. 1.—Triple-concentric to Three-core Cable Joint.

The writer at the present moment is not aware of this method of jointing ever having been previously adopted; but if there are any readers who have put the idea into practical use, the writer would be glad if they would kindly give their views with regard to this class of joint.

Telephones in France.—The Société des Telephones Mildé is the name of a new company which has lately been formed in Paris, with a capital of £180,000, to manufacture telephonic apparatus.

D.

OVERSEAS TRADE AFTER THE WAR.

By ANDREW STEWART, M.I.E.E.

The fact that any scientific or learned society should spend an evening discussing the development of overseas commerce is another reminder that the war has shaken our most cherished institutions to their foundations, and, whether we like it or not, changes are taking place in our outlook and practice which would have been considered impossible a few years ago.

Papers on commercial policy have always been considered outside the scope of a learned or scientific body, not so much because the subject is unscientific or because the exponents of commercial policy may be less learned than those who could deal with the properties of materials and the laws governing their use, but probably because, not being an exact science, and being bound up with problems of a more mercenary and controversial nature, they were likely to give rise to differences of opinion which might disturb the harmony of the well-ordered scientific mind.

Such papers, however, have their dangers. Mr. Andrews's interesting contribution did not go far to disturb the scientific mind, but we can imagine a paper on the commercial aspect of the Coal Conservation Sub-Committee's Report. The advocates of municipal or State control, led, say, by Mr. Pearce, and the advocates of private enterprise no less ably generalled by a veteran like Mr. Madgen—well, there would be dirty work in Westminster that night!

It is to be hoped, however, that the Council of the Institution, guided by our able and tactful President, will do what they can to prevent the Institution of Electrical Engineers from sliding down the slippery slope of controversial commercialism.

To return to Mr. Andrews's paper on "The Overseas Distribution of Engineering Appliances," it appears to the writer, who has had a good deal of experience in selling electrical apparatus abroad, particularly in Europe, that the problem of developing external trade is more a question of simplifying, not complicating, the distribution of the goods.

A great and complex organisation which intervenes between the manufacturer and the user seems to be an unnecessary link, reducing the efficiency and adding to the cost in much the same way as an unnecessary number of transformers and converters in a transmission system.

I have used the analogy because it appeals to the engineering mind, and I want to disown it at once, and to direct the reader's attention to the theory that sales organisation is not an exact science at all.

What is more natural to an engineer than to apply engineering analogies to trade problems; to liken manufacturers to generators, a control board to a switchboard, and a distributing and selling organisation to the distribution system with its rows of consumers, is all very nice and impracticable, for the analogy is bad!

Business, like medicine, is not an exact science. When a doctor gives a patient a dose of any particular drug, he is not sure what the result will be. The result of a drug can never be predicted with accuracy, so many variables, such as the constitution and idiosyncracies of the patient, have to be taken into account. Thus certain things have uncertain results. In business various customers are impressed in different ways. A feature in design that has no interest for one purchaser, will charm the dollars out of the pocket of another.

In engineering, on the other hand, any variation in the chemical or physical properties of a material has definite and calculable results. That is why the engineer is not often a good business man; he applies exact standards to things that are inherently inexact.

Business is not science at all—it is common sense; and when we try to treat it as an exact science we run full tilt up against reality and attempt the impossible. The successful business man is usually possessed of a searching and comprehensive mind; the engineer, on the other hand, has a mind that is intensive and inventive, with some special bent—two very different types. These two qualities are seldom found together.

Most business failures are due to want of common sense, for, like most seemingly simple things, the application of common sense to business problems is uncommonly difficult. We must, therefore, be prepared to treat business problems as something inherently different from engineering problems.

A controlling organisation composed of representatives from Chambers of Commerce, Ministry of Reconstruction, Board of Trade, Foreign Office, Engineering Standards Committee, Federation of British Industries, Shipping Merchants (what has the B.E.A.M.A. done to be left out of this list?) would become a formidable and inflexible bureaucratic institution, like unto a Government Department, possessing neither soul to be damned nor body to be kicked, but an unending source of bulletins, instructions, and regulations, which would probably prove of greater benefit to the paper-making, printing, and waste paper industries, than to the engineering industry which it was supposed to represent.

Such an organisation, if it were composed on anything like the lines indicated by Mr. Andrews in his paper, would no doubt be housed in some building worthy of the Board's size and status. It would probably be staffed by an army of pig-tailed flappers, dressed in transparent stockings and fur coats, the usual uniform of the Government officialette.

The click of the typewriter, the clatter of tea cups, and other sounds usually associated with feminine industry, might be heard from early morn till dewy eve, but what shall it profit the British manufacturer if he get all these things, and yet lose the business because his prices are too high? Price, not distribution, is the crux of overseas trade.

Would an organisation such as this be superior to the established order of things? Would it give greater satisfaction to the overseas purchaser? Is there any organisation or institution of the kind in existence that gives the satisfaction, celerity, and personal interest that the average purchaser expects from the firm that supplies the machinery he wants?

We have first, last, and all the time to please the user, and by this test any controlling or selling organisation will be judged.

Our export trade is obtained and held because the user knows he is dealing with a reliable and reputable British firm, who generally lose no time in putting right any trouble that may arise. Would the user fare better were he annoyed and irritated by the circumlocutory methods of a bureaucracy?

The success of the Allgemeine Elektrizitäts Gesellschaft, Bergmann, Siemens, and other German undertakings was due to the fact that the user could get their products from branch offices in most parts of the world, and repairs and renewals were effected quickly and cheaply from parts obtainable from their branch houses anywhere; there was no difficulty or delay in dealing directly with headquarters, and headquarters invariably displayed a personal interest, often only artificial, but no less satisfactory to the customer, when there was a difficulty or grievance. How can we hope to succeed if we interpose a cold-blooded and lethargic official or officialette between the manufacturer and his client?

Individualism has made us a great nation. It is suited to our temperament and inclinations; we must see to it that in the evolution of new business methods we do not become willing victims of the dire despotism of a disinterested and domineering bureaucracy.

U.S. Engineering Council.—At the first annual meeting of the Engineering Council, on February 21st, Mr. J. Parke Channing was elected chairman, Messrs. H. W. Buck and G. F. Swain vice-chairmen, and Mr. A. D. Flinn secretary. The Council is now composed of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, having a membership of 33,000, and known as "founder societies." The new chairman is vice-president of the Miami Copper Co. and the General Development Co.—*Electrical World.*

PREVENTABLE WASTE OF COAL.

In a letter to the *Electrical World* of March 16th, Mr. G. W. Partridge, engineer and manager, London Electric Supply Corporation, Ltd., refers to a paper by Mr. D. M. Myers on the above subject, and makes the following remarks on two devices which he has at work at the Deptford power station, London, and which have proved to contain great possibilities in the way of coal saving.

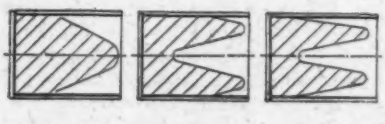
Figs. 1 and 2.—Fixed Clinker Dams.

Many classes of coal tend to "spread" on the grate in open formation, with isolated patches and intervening bare spaces, making necessary some form of clinker dam or dumping bar at the rear end, in order to hold the coal back and maintain a compact fuel-bed until combustion is completed. The dam in general use has hitherto been of the fixed type, two forms of which are illustrated in figs. 1 and 2. Mr. Partridge has found, however, that these fixed bars have very considerable limitations, as if they are made sufficiently high to bank up and retain efficiently the "spreading" classes of coal, the ash and clinker will not pass over, but effect a lodgment on, and choke up, the grate. On the other hand,

Figs. 3 and 4.—Adjustable Dumping-Bar Set for Spreading Coal and Close-Lying Coal.

if they are made sufficiently low to clear the ash refuse, the grate fails to retain the "spreading" coal, with the result that a large amount of excess air is admitted, due to the open formation of the fuel-bed.

To overcome this difficulty, the first device which has been adopted consists of an adjustable dumping-bar, one design of which is illustrated diagrammatically in figs. 3 and 4. The dumping-bars, of sectional type, pivot on supporting plates which make an air seal with a fixed "former" plate, this plate constituting the front side of the ash-pit. The bearer bar carrying the sealing-plate and dumping-bar can be raised or lowered by hand, or, preferably, by means of a small hydraulic cylinder connected to the feed-water mains, the operating cocks being placed adjacent to the sight-door at the rear end of the furnace. These dumping-bars can, therefore, be set at the most suitable height for the particular fuel that is being burned, and, should the accumulation of clinker require it, can be readily operated by merely lowering the bars for a few minutes until the *débris* has passed over, when they can be reset at the original or any suitable height. The main features of this apparatus are :—Flexibility of parts ; wide angular rotation of the



Figs. 5, 6 and 7.—Uneven Distribution of Coal Sometimes Obtained on Grates.

ash-receiving face ; quick and ready renewal of parts ; rocking or pushing back avoided ; complete air seal in all positions ; ease of operation.

The second device referred to above applies to the furnace door. One essential condition for good furnace efficiency is that the whole area of the grate up to the dumping bars should be equally covered by the fuel. Frequently the fire fringe assumes forms such as are indicated in figs. 5 to 7. These irregularities may be due to various causes, such as size and constitution of the coal, design of the chute feeding the coal hopper, or some feature in the design of the arch or furnace setting. It is also found that distortion and collapse of the type of guillotine door generally in use is not infrequent, more especially when burning fierce or highly-volatile coals on a furnace setting which has been designed to give good front-end ignition with low volatile or low-grade fuels. He has found these difficulties almost entirely overcome by the use of the sectional adjustable door illustrated in fig. 8, which it will be seen consists of a series of narrow doors suitably lined with fire-brick and fitted with renewable shoes, each one separately and pivotally hung from a common bearer girder and individually adjustable, and so arranged that they may be collectively raised or lowered as required. Advantages of this design are, briefly :—

Control of the fuel thickness, and, therefore, of the distribution of the fire over the grate area ; durability of parts ; quick and ready renewal of burnt parts ; freedom of working ; effective air sealing.

The advantage of having the adjustment and flexibility of these two devices will be obvious to all users of chain or other travelling-

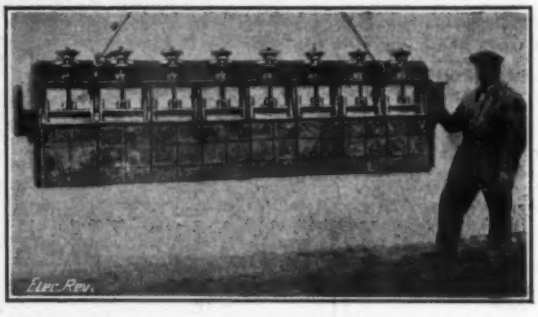


Fig. 8.—Sectional Adjustable Gate for Insuring Uniform Fuel Bed.

grate stokers under any conditions of working with high or low-grade fuels, and they should be found particularly effective in improving the efficiency of boiler plant with the poor-quality coals at present being handled.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Reinforced Non-Ferrous Metals (Denny's Process).

A somewhat original method of reinforcing metals, in a similar way to that of making reinforced concrete, has been devised and patented by Mr. C. W. Denny, of 22, Edwardes Square, Kensington, London. The process, which lends itself to the manufacture of tubes and plates, would appear to have a very large field of application in various arts and manufactures. The reinforcing metal is preferably perforated steel of suitable thickness for the work and two notable applications are to copper and lead. In making reinforced copper the perforated metal is prepared by any well-known method for electro-deposition, and finally copper-plated to any required thickness, the deposition of copper going right through the holes, and finally forming a sheet of copper with the steel core inside. The process of deposition entirely locks the

Fig. 1.—Reinforced Copper Plate in Course of Formation.

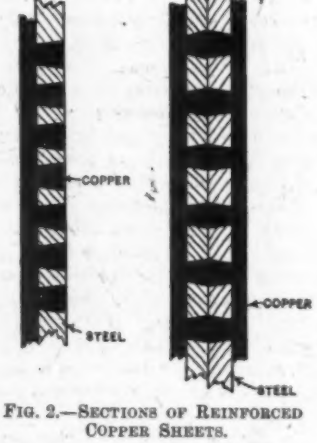


Fig. 2.—Sections of Reinforced Copper Sheets.

copper to the steel, and a plate so formed will stand bending and pressing without the copper leaving the iron in any way, the copper being perfectly adhesive to the whole surface and mechanically locked to the steel. The accompanying illustration, fig. 1, shows a plate in various stages of the process.

In some cases the copper can be rolled on hot. The saving in the use of reinforced copper is in the neighbourhood of 50 per cent., and its application to electrical purposes would, no doubt, show a great economy.

The reinforcing of lead with steel can be carried out in a similar

manner to that described above; but as lead is a much softer metal than copper, it has been found quite practicable to reinforce lead in the form of sheets by simply rolling or pressing the lead into the perforations.

The manufacture of lead-lined tubes is somewhat more difficult, involving the use of drawing methods. We understand that Mr. Denny has a process for the manufacture of tubes, tees, and bends with reinforced lead, which will be a big advance on the present methods of producing such articles. The lead lining of tanks, cylinders, and the like can now be commercially carried out from reinforced lead sheets, it only being necessary to burn the joints. Such products would, no doubt, have a wide application in chemical and dye works equipment, and in all cases where acid fumes or acidulated liquids have to be stored, conveyed, or brought in contact with steel or ironwork. The illustrations in fig. 2 show sections of reinforced copper, showing the mechanical lock which is so important in combining two metals together.

Reinforced copper as applied to electrical work has a magnetic effect, owing to the steel core becoming magnetised by the passage of current through it, and might be of advantage, Mr. Denny suggests, in constructing switch blades, controller fingers, &c.

Owing to the restricted use and general shortage of non-ferrous metals, reinforced non-ferrous metals might with advantage be used for many purposes.

Aeroplane Lighting Set.

Messrs. Joseph Lucas, Ltd., Birmingham, who have for some years specialised on the production of electric lighting sets for use on motor cars, are now devoting attention to such installations for aeroplane lighting purposes. Among their interesting productions in this direction is a 12-volt 250-watt dynamo, which runs at a speed of 3,500 r.p.m., and is combined with the propeller of the machine.

E.M.C. Fans.—Referring to the note on these fans in our last issue, we unintentionally misstated the maker's claim, which was that the fans fitted with regulation blades were more efficient than those fitted with box blades.

NOTES FROM CANADA.

[From our special correspondent.]

While fighting German autocracy, the democratic nations of the world are voluntarily submitting to all kinds of Government control and regulation. Canada, though perhaps somewhat belated in regard to such matters, usually having a considerable time lag, is no exception to the general rule, for, besides meatless days which have now been in force for quite a long time, there have been heatless days. Even eatless days have been jocularly referred to!

The 9th, 10th and 11th of February were, in Eastern Canada, observed practically as holidays, owing to the order of the Fuel Controller that all except certain favoured classes of industries, shops and offices should be closed to reduce the consumption of fuel to the lowest possible limit. Fortunately for the country those particular days turned out to be quite warm, as there was a general thaw—a great relief from the prevailing weather of the previous weeks, when even in Toronto, the temperature reached 25° and 30° F. below zero, this having been the most severe winter experienced for many years.

Because of the really acute shortage of coal which has been general all over the Continent of North America, the intense cold was a particularly awkward circumstance. There were signs of a shortage early, owing to congestion on the railways and to the great demands for coal made by the engineering and other industries on account of the war, but the heavy snowfalls, the low temperatures and the gales have added enormously to the difficulties of transportation and have created hardships among the people, especially the poorer classes, from want of fuel.

Owing to great water-power development, especially in Ontario and Quebec, electrical energy has become so cheap for power and lighting purposes, that people have begun to think that its use for heating is going to solve the fuel problem; this being the case it has been necessary for technical men to demonstrate the absurdity of the idea.

Ontario has no coal and is therefore dependent upon the United States for practically her entire supply of fuel at least for the cities—in the country districts wood is largely used. The acute fuel situation, both here and in the United States, has turned everyone's thoughts towards it, and Canadians are beginning to ask themselves what they will do for fuel in the event of the United States restricting the exportation of coal to the Dominion. This, if it does not occur soon, will inevitably come sooner or later on account of the gradual exhaustion of the supply over the border.

As usual, electricity was hailed in many quarters as the saving clause, since Canada is so well off for water-power, but quite a simple calculation will show beyond question that all Canada's share of the power of Niagara Falls would not heat the homes of Toronto alone, to say nothing of the power requirements, lighting, tramways, and the heating of offices, factories, &c., and that all the available water-power of Canada would not warm the homes of Ontario alone. Electrical energy has a distinct and very useful place for special purposes, such as cooking, &c., in the Canadian climate, as an auxiliary to other methods of heating, to furnish heat in the cool days of late spring and early autumn, but decidedly not as a general heating agent on a large scale throughout the winter, and this is not merely because of excessive cost (electricity at ½d. per kw.-hour is about four times as expensive for heating a house as anthracite at £2 per ton—2,000 lb.), but on account of the enormous quantity of power that would be required, as indicated above. On the other hand, electricity can be very profitable, from the point of view of conserving fuel supplies employed for mechanical power purposes. Engineers in the United States have recently been pointing out the enormous saving in fuel that could be effected if all the railways were operated by electric power, even if coal were the source of energy. The President of the American Institute of Electrical Engineers, in an address a few weeks ago, pointed out that for every 6 lb. of coal burnt on locomotives, and from which one h.p.-hour is obtained, three or four times as much work could be obtained from that quantity if it were burnt under the boilers of a large modern electric station and delivered to electric locomotives, thus the saving in coal due to electrification of the railroads would be very large indeed in the aggregate, and if hydro-electric energy were used it would, of course, be much larger. He also pointed out that great saving would result from the fact that at present some 15 per cent. of the coal used by the United States railways is employed solely for the purpose of hauling their own coal supplies—were these supplies no longer required, the whole of the trucks used could be employed for hauling profitable freight with the same track facilities.

The engineers of the Dominion, having warned the public of the seriousness of the coal problem, not only at the moment (as has been brought home forcibly to the said public by other agencies) but for the future, are now preparing to tackle the problem as they should by endeavouring to find the proper remedy.

Several proposals have been made already, of course; for example, the Department of Mines at Ottawa urges the immediate utilisation of peat bogs, of which there are extensive areas here; the Commission of Conservation is advising everyone to burn wood next winter, and recommends that municipal authorities should begin laying in stocks at once.

The Provincial Government in Ontario has already decided to cut timber on Crown lands and burn nothing but wood in all the provincial public buildings next season.

The Department of Mines, while advocating the use of briquetted peat for burning in stoves and furnaces for next winter, takes a much larger view and has pointed out what can be done by gasification, recovery of by-products, and generation of electric power.

CORRESPONDENCE.

Letters received by us after 5 p.m. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Association of British Electrical Engineers.

I have read with interest the information contained in your issue of April 5th, concerning this proposed Association.

Special emphasis is laid on the fact that it is in no sense intended to be a Trade Union.

In this connection it is, perhaps, worth considering the second report of the Whitley Committee, in which it is laid down that the expression "employers and workmen" used in these reports is intended to cover State and municipal authorities and persons employed by them.

The Committee recommend that such authorities and their workpeople should take into consideration the proposals made in these reports, with a view to determining how far they can suitably be adopted.

This unquestionably may be regarded as an indication that the Whitley Councils may, and probably will, be applied to municipal electricity supply departments.

The first Whitley Report states quite definitely that membership of the Councils is confined to representatives of the employers and Trade Unions. Other organisations are either excluded or admitted only by consent of that side of the Council of which they would form a part.

The management or executive section of industry has been excluded (I believe with full intention) from the Whitley Councils, doubtless because its members have hitherto been averse to anything which savours of Trade Unionism, and are entirely unorganised.

Before it is too late, I suggest to the founders of this new organisation that they reconsider their position, and form themselves into a body which may receive some measure of consideration when the vital questions which will be raised at the Whitley Councils come to be discussed. Otherwise, there seems little doubt that between the municipal authorities on the one side and the Electrical Trades Union on the other the members of the B.E.E. will be ground exceeding small.

Doubtful.

Electric Power Supply and After-War Industry.—The Newcastle resolutions, printed in our issue of April 5th, were carried unanimously at the annual general meeting of the Association of Chambers of Commerce on 10th inst. Copies of the resolutions were forwarded to the Minister of Munitions in addition to the other Ministers mentioned.

LEGAL.

Calderwood v. Coniston Electrolytic Copper Works, Ltd., and Douvreleur.

In the King's Bench Division, on Monday, Mr. Justice Coleridge had before him an action brought by Mr. John Jackson Calderwood, an engineer, of Seven Kings, Essex, against defendants, of Warwick Court, Gray's Inn, and Raymond Douvreleur, of Yauche Loire, France, claiming £150, four months' arrears of salary at £450 a year as engineer of a company formed to extract copper from mine dumps by the electrolytic process. The defence was that plaintiff's agreement terminated on November 6th, 1916, and that he had been paid his salary up to that date.

Mr. Frank Powell, K.C., for the plaintiff, said although the defendant company was registered in England, everyone connected with it, except the secretary, was French. The other defendant—M. Douvreleur—was the chairman of directors. The company got a lease of property consisting largely of dumps from old copper mines near Lake Coniston, in Lancashire. It was thought there was enough copper in the dumps to make it worth while to apply an electrolytic process for its extraction. The ordinary process would have been too expensive. The electrolytic process did not prove to be successful, the company got through its money, and the shareholders declined to find more. M. Douvreleur said the thing had better be closed down, but plaintiff suggested that someone else might be found to provide the money for another process. Eventually Baron de Catelin came over from France, inspected the property, and expressed his satisfaction, but later intimated he did not intend to take over the property. Plaintiff claimed wages from November 6th till the date in March when Baron de Catelin sent his intimation.

Mr. Lewis Thomas, K.C., in defence, said plaintiff's continuance after November 6th was conditional upon Baron de Catelin purchasing the mines, which he did not do.

His Lordship entered judgment for plaintiff for £150 as against the company and for M. Douvreleur as against plaintiff, the costs to be apportioned by the Taxing Master.

Using Current During Prohibited Hours.

The *Times* reports that on 18th inst., at Woolwich Police Court, W. Maskell was fined £5 under the Lighting, Heating and Power Order, for causing electric current to be consumed at the New Cinema, New Road, Woolwich, during prohibited hours. Sergeant Kilby said he found a kinema entertainment in progress at 11.30 in the morning. Under the Order, power was not allowed to be used for the purpose of entertainment before 1 p.m. The defendant said that he had written to the Board of Trade asking for exemption from this rule, and thought he could continue the morning show pending a decision.

WAR ITEMS.

Copper and Aluminium in Germany.—Discussing the statements made recently by the chairman of the British Aluminium Co., a leading German newspaper observes that it is no secret that Germany has embarked upon the production of aluminium on a large scale during the war, although opinions differ as to whether the German works will be able to meet international competition after the war. It is considered, however, to be certain that the reported increase in the British production of aluminium, proceeding simultaneously with a very large augmentation in the output of copper in the period succeeding the war, will render not improbable some over-production of the latter metal. If the copper needs of Britain and her Allies are estimated at 50,000 tons per month for war purposes, the German newspaper remarks that it is obvious that these requirements will be considerably reduced the moment peace is concluded. This circumstance is regarded as of importance to Germany, as the newspaper states that it awakens the hope that the present exceptionally high prices for copper will fall through this disproportion between supply and demand, and especially that there will be no question that it will be rendered possible for Germany to continue to obtain supplies of the indispensable copper, despite the competition of aluminium and other metals.

After-Meeting Refreshments.—The annual meeting of the Dansk Elektroteknisk Forening was recently held in Copenhagen. According to the *Teknisk Tidskrift*, of that city, the meeting was followed by refreshments, at which whisky and soda, coffee, and Vienna bread were served at a charge of 1 kronor (about 1s. 1½d.) per person.

Trading with the Enemy.—The "London Gazette" for April 19th contains further lists of bodies and persons in the following countries with whom trading is prohibited:—Chile, Colombia, Denmark, Ecuador, Mexico, Netherlands, Netherlands East Indies, Peru, Fernando Po, Spain, and Sweden.

Exports to China.—Names of further persons and bodies in China to whom exports may be consigned appear in the *London Gazette* for April 19th.

Ministry of Munitions Order.—The Minister of Munitions has issued an Order prohibiting the use, purchase, sale, or delivery of any gas works retort carbon, coke oven carbon, or pitch coke, except under permit and to permit holders.

Exemption Applications.—At Morecambe, last week, in the case of H. L. Bentley, foreman fitter, aged 38, single, Class A, and A. Darnborough, electrician, aged 32, single, Class B 1, both employed in the Corporation electricity department, Mr. Annetts, the borough electrical engineer, said he had done all in his power to get substitutes, and had advertised extensively. He got a wounded soldier, but after going to the trouble of training him he went on to munitions. The National Service Representative hoped the Corporation, who were represented by Mr. T. P. Tilly (town clerk), would not appeal again for any Class A man, who were now wanted. Temporary exemption to May 1st was allowed.

At Oxford, on April 15th, there was a review of the case of A. W. Oakley (37), unit adjustor, with the Electric Tramway Co., and two months' exemption was granted.

Bath Tribunal has refused exemption to V. B. Rummings (18, Class A), engaged with the Electric Tramways, Ltd.

West Kent Appeal Court heard a National Service appeal against C. S. Padgham (39, Grade 2), engaged at the Tonbridge U.D.C. electricity works. The exemption was cancelled, with 28 days' grace.

The Malvern Tribunal has, on the application of the Military, withdrawn exemption held by S. Armstrong, electrician, on the ground that he has left the position he held when exemption was granted.

Mansfield Tramway Co. appealed for the retention of W. J. Ashburner (39, C 3), permanent-way foreman, twice rejected. Conditional exemption was conceded.

At Coventry, the National Service Representative appealed against exemption held by a charge-hand (34, C 2), and seven stokers, three in Class A, one in B 1, and three in C 1, engaged at the municipal refuse destructor works. The charge-hand and the six stokers had their exemption confirmed, and the other stoker was ordered to join up in 28 days.

At Oxford, a review was made by the County Appeal Court of the case of W. Townsend (27, general service), shift engineer at the Witney U.D.C. electricity works, given three months' exemption on March 20th. The engineer and manager (Mr. Curel) stated that when engaged Townsend had been totally rejected. The exemption was cancelled.

Bradford-on-Avon Tribunal has granted exemption until May 30th to E. E. Daniel (41, C 2), electrical engineer at Winsley Sanatorium.

At Faringdon, the National Service Representative applied for the withdrawal of conditional exemption held by John Launchbury (30, B 1), engineer with the Electric Light Co., on the ground that it was not in the national interests that he should remain in civil life. As he is the only practical man left who understands the plant, &c., the Tribunal decided that he could not be spared, and the exemption was confirmed.

Tunbridge Wells Tribunal has granted three months' exemption to A. E. Hills, electric light wireman.

At Lancaster, a local firm appealed for the retention of an electrician and fitter (41, C 1), the only one left in their employ, and whom they had failed to substitute. A fresh medical examination was ordered.

At Bedford, exemption until July 15th was granted to R. N. Turner (21), electrical fitter, engaged with the Igranic Co.

BUSINESS NOTES.

Overseas Trade Advisory Committee.—The following gentlemen have been appointed to serve as a Committee to advise the Department of Overseas Trade (Development and Intelligence) on matters relating to the activities of the Department:—

Sir Francis Barker, of Messrs. Vickers, Ltd., representing the Federation of British Industries.

Sir Algernon F. Firth, Bart., chairman of Messrs. T. F. Firth & Sons, Ltd.; director of the British Trade Corporation, representing the Association of Chambers of Commerce of the United Kingdom.

Mr. W. H. N. Goschen, of Messrs. Frühling & Goschen, merchant brokers; director of the British Trade Corporation, the Atlas Assurance Co., Ltd., &c.

Mr. W. L. Hichens, chairman of Messrs. Cammell, Laird & Co., Ltd., director of Coventry Ordnance Works, Ltd., &c.

Lord Inchcape, G.C.M.G., chairman and managing director of P. and O. Steam Navigation Co., &c.

Mr. Water Leaf, chairman of London County and Westminster Bank, Ltd., deputy chairman of Central Electric Supply Co., Ltd., chairman of St. James's and Pall Mall Electric Light Co., Ltd.

Mr. Kenneth Lee, of Messrs. Tootal, Broadhurst, Lee & Co., Ltd., director of British Dyes, Ltd.

Mr. G. A. Moore, of Messrs. Holt & Moore, merchants, Liverpool; director of Niger Co., Ltd., chairman of the Executive Merchants' Committee of the Liverpool Chamber of Commerce.

Mr. J. W. Murray, of Messrs. Ker, Bolton & Co., merchants, Glasgow; chairman of the Glasgow Chamber of Commerce.

Sir George A. Riddell, Bart., chairman of the Newspaper Proprietors' Association.

Mr. C. V. Sale, of Messrs. Sale & Co., merchants and shipowners, deputy Governor of the Hudson Bay Co.

Capt. Albert Smith, M.P. for the Clitheroe Division of Lancs.

Col. Frank H. Wedgwood, of Messrs. Josiah Wedgwood & Sons, Ltd. chairman of Industrial Council for the Pottery Trades.

Catalogues and Lists.—Messrs. Higgs Bros., Summer Hill Street, Birmingham.—Stock list of standard shunt-wound ventilated motors.

Messrs. Gent & Co., Ltd., Faraday Works, Leicester.—New edition of their "Book 5," containing full and illustrated description and prices of their electric clocks, sound signals, and synchronisation of existing workmen's clocks. The issue of this new (60 pp.) catalogue, in which are embodied all the latest improvements and additions to the firm's "Pulsynetic" system, has been necessitated by the increasing demand for correct and uniform time throughout munition works, shell-filling factories, and other large works.

Messrs. E. Bennis & Co., Ltd., 28, Victoria St., London, S.W. 1.—Sixty-four-page finely-illustrated catalogue showing and describing their various types of coal and ash plant for coal transport, coal storage, ash transport, and shell transport. Copies will be sent on application.

Bankruptcy Proceedings.—Charles Damey, electrical engineer, 24, Upper Marylebone Street, W., formerly trading at 1, Wardour Mews, Wardour Street, W., under the style of Easthope and Co.—The public examination was held on April 17th. before Mr. Registrar Hope, at the London Bankruptcy Court. The accounts showed liabilities £829 (unsecured, £755) and assets "nil." In reply to the Official Receiver, the debtor stated that from 1909 to August, 1913, he was partner in the firm of Kingolite Co., electrical engineers. At the latter date the business, together with that of another firm, was purchased by the Kingolite Co., Ltd. Witness received £1,200 in shares as consideration for his interest in the business; he subsequently acted as director of the company without fees, and as its works manager at a salary. He resigned office at the beginning of 1915, and in April of that year commenced business on his own account at 1, Wardour Mews, under the style of Easthope & Co. Early in 1916, witness secured contracts from the Ministry of Munitions, the bulk of which were passed on by him to another firm for execution on a commission basis, he being employed by the firm as consulting engineer, but in consequence of faulty work done by the firm and delay in delivery, his contracts were cancelled by the Ministry in June, 1916. In the following November the greater part of his plant and effects were seized by a bill of sale holder; subsequently very little business was transacted, and he closed down in August, 1917. Witness attributed his failure to expenses incurred in experimenting with various inventions of his own, to the failure of the before-mentioned firm to fulfil munition contracts, and to liability under a judgment. The examination was concluded.

Mountain, Montague Brown (The Economy Appliances and Engineering Co.), engineer, 66, Victoria Street, S.W.—Last day for receipt of proofs for dividend, May 3rd. Trustee, F. W. Davis, 95-97, Finsbury Pavement, E.C. 2.

Felgate, A. E., & Storey, W. (Felgate & Storey, electrical engineers), Reading.—Last day for receipt of proofs for dividend, May 4th. Trustee, E. W. J. Savill, 14, Bedford Row, W.C. 1.

Liquidations.—Electric Lighting and Engineering Co., Ltd.—Meeting of creditors at 43, Castle Street, Liverpool, on May 9th. Liquidator, R. T. Langdon.

Carbonoid, Ltd., Eldon Street, London, E.C.—Liquidator (Mr. H. de V. Brougham) released April 15th.

Football.—On Saturday last, the Ladies' Football Team connected with the Dagenham Works of the Sterling Telephone and Electric Co., Ltd., who have an undefeated certificate, at Southend-on-Sea, on behalf of the three War Hospitals at the Essex seaside resort, met the undefeated Vickers Ladies (Crayford and Dartford), a very fine game resulting in a draw of two goals each.

Electric Welding in Italy.—An exhibition of electric welding processes was given recently at Milan, on the suggestion of Signor Bignami, the Under Secretary of State, under the conviction that the present time in Italy affords a suitable opportunity for displacing acetylene welding, there being a demand for greater supplies of carbide of calcium for the manufacture of nitrogenous manures. Moreover, difficulties of transport militate against the use of the latter, as do the risks attending packing, &c. An agitation in favour of electric welding is, consequently, to be promoted throughout the kingdom.

Patents and Alien Enemies.—Application has been made by Mr. E. E. Greville to the Board of Trade to avoid or suspend Patent No. 6,424/09 granted to Thompson (Ges. für Drahtlose Telegraphie m.b.H.) in connection with electrical oscillations.

Book Notice.—Messrs. H. K. Lewis & Co., Ltd., of 136, Gower Street, London, W.C. 1, have issued a catalogue of their college text-books and works of reference on chemistry, engineering, physics, &c.

Trade Announcement.—Owing to shortage of staff, the Electric Street Lighting Apparatus Co. have decided to close their London office at 11, Victoria Street, S.W. 1. All communications should be addressed to the works, the Foundry, Canterbury. Telephone, 17 Canterbury.

Sweden.—A new electrical engineering undertaking has lately been formed at Malmo, with minimum and maximum capitals of respectively £7,000 and £21,000 and the title the Elektriska Fabriks Aktiebolag.

LIGHTING AND POWER NOTES.

Belfast.—Economies.—The Corporation is about to introduce drastic economies in public and private lighting and in the tramway system by earlier closing hours for business and pleasure places, and the reducing of tramway services, especially on Sundays. The renewal of the economisers and boiler tubes at the generating station having become necessary, the makers, Messrs. Green & Sons, tendered at £756 10s., Messrs. Mannesmann Tube Co. for the tubes, and Messrs. Babcock & Wilcox for the skilled labour. The whole, costing over £1,300, is to be carried out at once. At the recent L.G.B. inquiry into an application by the Corporation for sanction to raise a loan of £310,705 for the purpose of building a new generating station and extending the electric lighting of the city, Sir John Snell was examined regarding its necessity. He expressed the opinion that in some cases temporary buildings would be possible if all building material were not forthcoming. Alderman John Tyrell remarked that if Belfast Corporation had taken Sir John Snell's advice in 1914, not only would the new power station have been in operation, but about £100,000 would have been saved on the transaction.

Birmingham.—Revaluation.—The Overseers have caused a revaluation to be made of the Corporation undertakings, resulting in the following increases:—Electricity, £38,907; gas, £6,551; tramways, £10,000.

Bootle.—Linking-up.—The T.C. has agreed to the proposal for an interlinking of the Bootle and Liverpool electricity undertakings and for a bulk supply by the Liverpool Corporation to Bootle.

Bury St. Edmunds.—The T.C. has offered to supply energy for lighting and power to the works of Robert Boby, Ltd., at 2d. per unit, provided the firm pays £400 towards the cost of mains, &c. The anticipated minimum consumption is 150,000 units per annum, and the capital outlay to give supply, £800.

Continental.—France.—The Compagnie Electrique de la Loire et du Centre has recently established a new electricity generating station with an annual capacity of 30,000,000 kw.-hours, to utilise the water power of the Besbre Falls on the River Loire. The power generated will be transmitted to Roanne for use in connection with the arsenal at that place, supplementing that drawn from the Chatel Montagne Station at La Voudriat.

Sweden.—A new company has lately been formed at Lillpite, with the title Lillpite Elektriska Kraft Aktiebolag, to establish a small electric power plant in that town.

Crompton.—Prov. Order.—At a special meeting of the U.D.C., last week, it was reported that the Board of Trade had written stating that, pending any action that might be taken as a result of the report of the Coal Conservation Sub-Committee and the Electric Power Supply Committee, they were unable to proceed with the application of the Council for a Provisional Order for electric lighting in the district. If in the light of any recommendations it was found permissible to entertain a fresh application, the Board would be prepared to consider the matter without further fee. Councillor A. Clegg, J.P., the chairman, said the Council should enter an emphatic protest against the Board of Trade's attitude, and point out that the main difficulty—that of laying a cable—was being got over by the installation of a cable for Government purposes in the district, and that it was essential that their request should be granted. It was decided to send a strong letter of protest.

Fuel Economy.—It is stated in *The Times* of April 18th that where new appliances consuming gas have been put into use by their customers since March of last year, the South Metropolitan Gas Co., on application, will assess the additional amount of gas that may be used; electricity consumers, therefore, who are in a similar position, and are unable to reduce their consumption by one-sixth, should apply to their respective suppliers for guidance in this matter. Persons holding contracts for Government work, whose businesses are not controlled, and who cannot comply with the regulation, should apply to the Board of Trade for licences to exceed the limits specified. The Board, it is stated, will give very sympathetic consideration to cases where the compulsory reduction presses hardly on consumers who had already, by rigid economy, reduced their consumption to the minimum, and as the object of the order is to save coal, favourable consideration will be accorded to consumers whose use of electricity exceeds the rationed quantity if they can show that the consumption of coal for the household has been correspondingly reduced, as, for example, by the adoption of electric cooking.

Iceland.—Hydro-Electric Scheme.—It is reported from Copenhagen that at a meeting held there of the Norwegian-Icelandic Co., Titan, it was decided to erect six hydro-electric stations for the utilisation of the Tjordsaa, which is the largest river in Iceland. It is believed that in this way power exceeding 1,000,000 h.p. would be brought into use, which would form the basis for the development of Iceland as an industrial country. It is proposed, in the first place, to embark upon the fixation of atmospheric nitrogen, and, in the event of the realisation of the scheme, also to construct a railway to Reykjavik of the length of 40 miles.

India.—Koyna River Hydro-Electrical Scheme.—The scheme aims at the establishment of a hydro-electric undertaking for the development on the West Coast of India of one of the biggest combinations of electrochemical industries in the world. The chief industry it is proposed to establish is the electrochemical production of aluminium from bauxite or laterite. The project will provide electric power extremely cheaply, and therefore a variety of industrial schemes—such as the production of nitrogen, iron, steel, and alloys—have come within the purview of Messrs. Tata's investigation. They do not propose themselves to enter into numerous industries of the kind, but their special aim would be to provide electric power and assist industrial experts to start industries depending upon it.—*The Times of India.*

The new electricity generating station at Loyabad, in the Bihar Province, which has been established by the Sijua (Jheria) Electric Supply Co., was recently put in operation. The plant, which is intended to provide the power necessary for the working of the Loyabad, Mudidih, Katras, and Choitodih Collieries, comprises a battery of three Babcock & Wilcox boilers, and two British Westinghouse steam turbines coupled to 2,000-kw. B.T.H. generators. The energy is generated at 6,000 volts, and is transmitted to the collieries by a ring main 14 miles in length. The new plant will displace nearly 200 boilers of various sizes in and around the collieries, and is expected to effect an economy in fuel consumption of approximately 80 per cent. It may be added that two of the boilers at the generating stations are coal-fired, while in the third steam is raised by means of the waste gases from the coke ovens at Loyabad.

Lord Lamington, speaking at the Society of Arts, on April 18th, on the development of water power in India, said there were tremendous supplies of water available for power in the southern part of the Bombay Presidency. He thought it would be a good thing if the Government made a complete survey of these and other sources with a view to their utilisation.

Lees (near Oldham).—Extension of Supply.—The U.D.C. has sent a letter of protest to the L.G.B. regarding the refusal to make an order for the extension of the supply of electricity to the district. It was stated it would involve the Council in expense to the amount of £100 if it again proceeded in the matter.

London.—L.C.C.—Loan Sanction.—The Finance Committee recommends the sanction of the Council to the borrowing of £58,000 by the Hackney B.C. for turbo-alternators, boilers, and auxiliary plant, and of £16,680 by the Stepney B.C. on account of expenditure incurred in respect of boilers, plant, and machinery, chiefly under contracts entered into up to September, 1917.

St. Pancras.—*The Daily Chronicle* states that the Council has been asked by the Board of Trade to furnish a fortnightly statement showing the total quantity of electricity generated and consumed.

Hackney.—Loan.—The Finance Committee reports that it has arranged the raising of a loan of £3,500 from the L.C.C. in connection with the linking-up with the North Metropolitan Power Supply Co.'s undertaking.

Barnes.—The Council has considered an application from the Beverley Brook Works for power supply, which will necessitate the provision and laying of an additional feeder cable, and has decided to give the supply subject to the company paying the cost of the cable, &c., and entering into a contract subject to the same conditions embodied in the agreement dated November, 1916.

The Lighting Committee has instructed the engineer to ascertain whether the police authorities would raise any objection if the street lamps were not lighted during the months of May, June, July, and August, except on the omnibus routes.

Mytholmroyd.—Prov. Order.—The B. of T. has informed the U.D.C. that it has been decided not to proceed with the application made this session by the Electrical Distribution of Yorkshire, Ltd., for a Provisional Order in respect of the districts of Luddendenfoot and Mytholmroyd.

Ormskirk.—The B. of T. has extended the time under the Ormskirk Gas and Electricity Act, 1915, for the period of one year.

Pembroke (Co. Dublin).—Supply Restriction.—The U.D.C. has announced that, owing to war conditions, Government restrictions as regards cable, &c., and fuel shortage, no new consumers can be supplied with electricity.

Rochdale.—Price Increase.—Further advances in the price of electrical energy are pending. It is understood that the recommendations are to make the increased charges up to 50 per cent. above the pre-war figure for lighting and 80 per cent. for power. The estimated increase in revenue will be about £5,000 a year. Lighting charges were increased by 10 per cent. in 1916, by a further 15 per cent. in May last, and 8½ per cent. in November. The coal clauses have largely regulated the charges for power, but there have been three increases to meet additional charges. It is expected that the deficiency on the works for the past year will be about £3,000, as against the big loss of £13,500 a year ago.

Shanklin.—Proposed Price Increase.—The Isle of Wight Electric Light Co. has applied to the B. of T. for permission to advance the charges for energy to 9d. per unit. The U.D.C. has decided not to oppose the application, but to request the company to agree not to charge more than 8d. without consent.

Shropshire Power Co.'s Bill.—A Select Committee of the House of Lords, presided over by Lord Muir Mackenzie, is considering the Shropshire, Worcestershire, and Staffordshire Electric Power Co.'s Bill, which is being opposed by the Midland Electric Power Co: the borough of Shrewsbury, the county borough of Stoke-on-Trent the Corporations of Walsall, West Bromwich, Wolverhampton, and the city of Worcester, the Association of British Chemical Manufacturers, and the Stourport U.D.C.

Mr. H. Lloyd, K.C., said the Bill would enable electric power to be provided on economical terms to a number of large towns in the Midland counties. The promoters were asking for power to compulsorily acquire a site on the River Severn, just outside Stourport, for the erection of large premises for the purpose of generating electric power, the manufacture of gas used in the generation of electricity, for dealing with residuals resulting from gas manufacture, and the erection of plant for the extraction of nitrogenous products from the atmosphere. The promoters agreed to amend Clause 26, which gave them power to enter into agreements with any distributing company, and all they now asked for was power to link-up with the Kidderminster and Halesowen Electric Traction Companies, and the Birmingham Corporation.

Mr. Madgen, chairman of the company, in support of the Bill, said that since 1908 the capital expenditure had increased from £35,809 to £710,217, and the revenue from £10,425 to £70,108. He did not anticipate any falling-off in the demand for electricity after the war, because electric power was essential to the economical carrying-on of every industry in the country. He proposed to put down plant of 80,000 kw. capacity, with 20,000-kw. stand-by. Mr. David Henry Martin, organiser of the Iron and Steel Trade Federation, said in that area they had suffered through the shortage of electricity. One large works lost on an average 21 hours per week through lack of power from September 10th to January 31st.

Mr. Talbot, K.C., said the joint opposition had no desire to hinder the development of electrical energy in the area, but they were of opinion that the large powers asked for ought not to be conferred, and that the area of supply should not extend northward beyond a line drawn from West Bromwich to Rowley Regis.

Mr. George Bean, chairman of Harper, Sons & Bean, Dudley, Smethwick, and Tipton, was of opinion that something ought to be done to speed up the production of electricity; on several occasions his works had to close down on account of shortage of power. Mr. Charles P. Sparks gave expert evidence in support of the Bill; in his opinion, it was essential that the promoters should have further generating powers, as their plant had been seriously overloaded for the last two years. He considered that the site selected for the new station was admirable in every way, having an adequate water supply and being within easy access to the railway and the coal fields. The Ministry of Munitions was officially supporting the Bill, and had placed a sum of £200,000 at the disposal of the promoters, in view of the importance of the undertaking.

Swansea.—The B.C. has been notified that, owing to unforeseen circumstances, the Harbour Trust will not be in a position, on June 30th next, to take the supply of electrical energy previously arranged for. It has been decided to vary the agreement, the date for the supply to be not later than June 30th, 1919.

Twickenham.—Price Revision.—The Twickenham and Teddington Electric Supply Co., Ltd., has informed the U.D.C. that, owing to the increasing cost of materials and labour, it has been obliged to apply to the B. of T. for its charges to be revised, and to substitute for the existing charges on the maximum-demand system a flat rate of 9d. per unit, with the proviso that the charge shall not exceed 8d. without the Council's consent. The Council has decided to object to the application.

TRAMWAY AND RAILWAY NOTES.

Ashton-under-Lyne.—Tramways Sale.—The T.C. has authorised a notice to be served upon the Oldham, Ashton, and Hyde Electric Tramways Co. requiring the company to sell to the Corporation so much of the undertaking as is within the borough.

Bradford.—Wages.—The award of Mr. J. B. Baillie, umpire in the arbitration between the Corporation and its employés, has been issued. The average bonus was 16s. per week over pre-war rates, and the workers demanded that it be £1, that men and women be paid alike for similar work, and that double time be paid for Sundays and Bank Holidays. The award gives general officials, clerks, inspectors, and collectors an increase of £6 10s. per annum for both men and women. Electricity department clerks receive 2s. per week additional on the existing bonus, and in the tramway department male clerks get 4s. and female ticket clerks 3s. per week. Certain clauses of the award are not clear to both parties, and inquiries have been directed to the umpire. A meeting of employés, last week, expressed keen dissatisfaction with the award, but in the meantime the items which are clear are to be put into operation this week. One of the grievances of the employés is that the tramway workers are entitled to back pay.

Burnley.—Late Car Service.—Tramway workers have accepted the offer of the Corporation Tramways Committee to run later cars if required, on the Committee's undertaking to run special cars night and morning for the convenience of the tramway employés.

Bury.—Fares Increase.—The Corporation Tramways Committee has decided to pay £5,000 to the credit of the borough rate. There was a profit of £4,873 on the Bury section, and on the

Radcliffe section a profit of £370 under the first agreement, and a loss of £398 under the second agreement. It has been decided to increase the fares on the Bury and Radcliffe sections by one half-penny, new penny stages to the town centre being fixed.

Doncaster.—Fares Increase.—To meet the recently advanced wages to Corporation workers and increased costs generally, the Council in Committee, last week, decided to advance fares on the Warmeworth route from 2½d. to 3d. for the whole journey, and from 3d. to 4d. on the Brodsworth route.

Fuel Economy.—An Order has been issued by the Board of Trade that, south of a line drawn from the Wash to the Bristol Channel, tramways must reduce their coal consumption by 15 per cent.

Glasgow.—The valuation of the T.C. tramway undertaking by the Assessor of Railways and Canals, for the year 1918-19, was reported to be £283,006, against £275,896 for the previous year.

Halifax.—Service Curtailment.—The Tramways Committee has appointed a Special Sub-Committee to consider further curtailment of the service, owing to labour shortage and the difficulties generally in tramway maintenance.

The Corporation tramcar which has been fitted as a travelling kitchen, for communal feeding purposes, and which is probably the first of its kind in the country, has two ovens, six steamers, and a boiler, all electrically heated, and arranged to cook from 800 to 1,000 meals at a time. The current is obtained from the overhead wires. The initial preparation of the food for cooking has to be carried out at one of the ordinary communal kitchens. Purchasers are served at both ends of the car. The actual uses to which the car is to be put are not quite decided, but it will probably serve to ascertain the places where kitchens are needed.

Huddersfield.—Women Drivers.—At a meeting of the T.C., last week, it was stated that the tramway manager had been instructed to make inquiries, and, if satisfactory, have a few women trained as tramcar drivers.

Leeds.—Fare Increase.—A scheme has been approved by the Tramways Committee for the abolition of ½d. tramway fares and the increasing of all other fares. The changes are based on a 1d. fare for 1 mile, and all 1d. fare stages will run consecutively from the centre to the termini, and will not overlap.

London.—L.C.C.—Wages.—The Highways Committee reports that the Committee on Production has stated that, if it is intended that the provisions of the award of March 8th (Tramway and Motor Omnibus Workers) relating to women should be applied in the case of the female employés of the Council's tramway undertaking, its view is that the war wages of those women of 18 years and over who have received the same war advances as male employés should be increased to the same extent as the men's, and that those women 18 years and over who are receiving less should be paid an advance of 4s. a week, the necessary further advance to be paid to such women when they have completed 12 months' service. This ruling is being acted on in applying the agreement, and the effect is that about 67 per cent. of the women will receive an immediate advance to £1 a week.

During the three months ended March 31st the Highways Committee has settled 940 claims against the Council in respect of accidents arising in connection with the working of the tramways, at a cost of £9,186. In 16 other cases, seven resulted in the Council's favour; in six the verdict was against the Council, and £311 and costs had to be paid; three cases were withdrawn.

Accident.—The *Times* states that a London United Tramway Co.'s car, proceeding through Brentford towards Hammersmith, overturned in the High Street, near the gasworks, on Sunday. Eleven persons were injured, the conductor the most seriously. The roadway was blocked for some time.

Light and Power Economies.—The *Daily Telegraph* states that a number of reductions in the train services on the Underground Railways will shortly take place during the slack business hours and after 11 p.m. In addition, commencing May 1st, a number of stations will be closed after 11.30 p.m. at night. On Sundays, commencing May 5th, certain stations will be closed all day. The Temple and Post Office Stations will be closed after 4 p.m., and Clapham Road will not be opened before that time.

Lowestoft.—In the *London Gazette* for April 19th official notice is given that under Sec. 41 of the Tramway Act, 1870, as the Lowestoft Corporation has for three months discontinued the working of part of Tramway No. 2 (Act of 1901), between Lowestoft North Station and Lowestoft Borough Boundary, "such discontinuance not being occasioned by circumstances beyond the control of the promoters," the powers of the promoters respecting it are ended as from April 11th, 1918.

Yorkshire.—Fares Increase.—The Yorkshire (West Riding) Electric Tramways Co., Ltd., announces a general increase of fares as from April 22nd. Stages are unaltered, but the minimum fare is increased from 1d. to 1½d., and other fares are increased by ½d. Workpeople and children's fares will be half ordinary fares, with a minimum of 1d. School children's return tickets and passes are withdrawn.

Rochdale.—Year's Working.—The results of the past year's working of the Corporation tramways show a net surplus of £8,351, as against £1,773 in the previous year, £3,609 in 1915-16, £4,284 in 1914-15, and £8,489 in 1913-14. The receipts were £108,472, an advance of £17,660, but working expenses increased by £6,195, and capital charges show an increase of £5,824. Half wages to men on Service and war bonuses amount to £8,495. The Committee is asking the Finance Committee to allocate the whole of the surplus to the renewals fund, which will then amount to £32,273. The sinking fund now amounts to £148,029, and the total capital outlay of the undertaking to date is £367,632.

CONTRACTS OPEN AND CLOSED.

OPEN.

Australia.—Melbourne.—June 7th. Department of the Navy. Supply and erection of power plant at Garden Island, Sydney. Director of Navy Contracts, Melbourne.

London.—Islington.—May 24th. Lighting Committee. 5,000-kw. turbine, alternator, exciter, condensing plant, switchgear, piping, &c., water-tube boiler, coal conveyor, telpher, burners, steam piping, &c. See "Official Notices" April 19th.

Newport (Mon.).—May 2nd. Electricity Department. E.H.T. and L.T. switchgear. See "Official Notices" April 19th.

Plymouth.—April 29th. Corporation. Turbo-alternator, converter, transformers, and switchgear. See "Official Notices" April 12th.

Redditch.—May 13th. U.D.C. Turbo-alternator, cooling tower, switchgear, water-tube boiler, &c. See "Official Notices" to-day.

Spain.—Tenders were recently invited by the municipal authorities of Don Benito (Province of Badajos) for the concession for the electric lighting of the town during a period of eight years. Not a single offer was, however, received.

The municipal authorities of Levida are at present inviting tenders for the concession for the electric lighting of the town.

CLOSED.

Government Contracts.—List of new contracts placed in March, 1918.

X-Ray apparatus.—H. W. Cox & Co., Ltd.; A. Lyon & Wrench, Ltd.
Motor converters.—Bruce Peebles & Co., Ltd.
Dynamos.—H. T. Boothroyd, Ltd.; City Electrical Co.; Electric Construction Co., Ltd.
Generating sets.—Bellias & Morcom, Ltd.; Browett, Lindley & Co., Ltd.; City Electrical Co.; Crossley Bros., Ltd.
Magnetos.—Fellows Magnetos Co., Ltd.
Motors, &c.—British Thomson-Houston Co., Ltd.; E. Brook, Ltd.; City Electrical Co.; Electric Construction Co., Ltd.; F. Parkinson & Co.
Switchboards and spares.—British Thomson-Houston Co., Ltd.
Transformers.—Foster Engineering Co., Ltd.

India Office. Store Department.

Armature.—General Electric Co., Ltd.

H.M. Office of Works.

Engineering services.—Aircraft Stores Depot, Regent's Park.—Electric wiring.—S. Reed & Sons.

Post Office.

Protective apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L.M. Ericsson Manufacturing Co., Ltd.; Western Electric Co., Ltd.
Telegraph apparatus.—British L.M. Ericsson Manufacturing Co., Ltd. Tyler & Co., Ltd.
Telephone apparatus.—British L.M. Ericsson Manufacturing Co., Ltd.; Gent & Co.; Peel-Conner Telephone Works, Ltd.; Western Electric Co., Ltd.
Submarine cable.—Siemens Bros. & Co., Ltd.; Telegraph Construction and Maintenance Co., Ltd.
Telegraph cable.—Hackbridge Cable Co., Ltd.; New Gutta-Percha Co., Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.
Dry cells.—British Ever-Ready Co., Ltd.
Telephone cords.—British Insulated & Helsby Cables, Ltd.; London Electric Wire Co. & Smiths, Ltd.
Glow lamps.—Edison Swan Electric Co., Ltd.
Enamelled copper wire.—London Electric Wire Co. & Smiths, Ltd.
Soft copper wire.—British Insulated & Helsby Cables, Ltd.

London.—L.C.C. Highways Committee. Three months ended March 31st. Accepted tenders:—

Rewinding armatures for electric tramcars—
P. R. Jackson & Co.—£106.
H. Dunn & Son.—£359.
Electrical Repair Co., Ltd.—£392.
Burdette & Co.—£808.
Collins Electrical Co., Ltd.—£322.

Steel and iron supplies—
32,720 chain-grate stoker links, £735.—Babcock & Wilcox, Ltd.
620 tons conductor tee rails, £11,626.—Frodingham Iron & Steel Co., Ltd.
2,250 driving wheel tires, £7,973; 1,500 pony wheel tires, £4,706.—Henry Bessemer, Ltd., and Cammell, Laird & Co., Ltd.
500 tons brake shoes for tramcars, £6,875.—Pease & Partners, Ltd.

Cotton-covered copper wire, Class T 6 B.—
Midland Electric Wire Co.—Items 2, 4, and 5 (50 per cent.), approximate value of contract, £2,515.
British Insulated & Helsby Cables, Ltd.—Items 1, 3, and 6 (whole); 2, 4, and 5 (50 per cent.), approximate value of contract, £4,436.

Stores and Contracts Committee. Accepted tenders:—

Electric insulating material, Schedule 15, for 12 months—
G. Haltersley & Sons, Ltd.
Hooper's Telegraph & India-Rubber Works, Ltd.
G. MacLellan & Co.
Micanite & Insulator Co.
J. Thompson.

Electric lamps, Schedule 17—

Cryselco, Ltd.

Electric traction glow lamps, Schedule 17D.—

Siemens Bros. Dynamo Works.

During the quarter ended March 31st last, 25,225 tons of coal and 773 tons of coke has been purchased for use at the Greenwich power station, at a cost of about £46,000.

Luton.—Electricity Committee. British Thomson-Houston Co., Ltd. Two 1,000-kw. converters, £8,004; switchgear, £489.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, April 26th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Ordinary meeting.

Institution of Electrical Engineers.—(Students' Section).—Friday, April 26th. At 7 p.m. At University College, Gower Street, W.C. Paper on "Electric Arc Furnaces," by Mr. J. A. Broughall.

Junior Institution of Engineers.—Friday, April 26th. At 7.30 p.m. At 39 Victoria Street, S.W. Paper on "Refrigerating Chambers and Heat Insulation," by Mr. E. C. West.

Friday, April 3rd. At 7.30 p.m. Paper on "Power Plants: National, Communal, or Industrial," by Mr. W. A. Tookey.

(North-Eastern Section.)—Tuesday, April 30th. At 7.15 p.m. At the Mining Institute, Newcastle-on-Tyne. Papers on "Synchronous Clocks," and "The Soldering of Aluminium."

Institute of Metals.—Thursday, May 2nd. At 5.30 p.m. At the Institution of Civil Engineers, Great George Street, S.W. Lecture on "The Formation of Diamond," by Hon. Sir C. A. Parsons, K.C.B., F.R.S.

Institution of Mechanical Engineers.—Friday, May 3rd. At 6 p.m. At the Institution of Civil Engineers, Great George Street, S.W. Discussion on the paper "Employment of Women in Munition Factories."

NOTES.

Metropolitan Association of Electric Tramway Managers.—A meeting of the members of this Association was held at the Municipal and County Club, Whitehall Court, S.W., on Friday last, when there were present:—Messrs. Ullmann (East Ham), chairman; W. E. Hammond (Met. Electric), vice-chairman; Slattery (West Ham); Schofield (Leyton); Murray (Walthamstow); Mason (South Met.); Harvey (Ilford); Mackinnon (London United); Birkett (Southend-on-Sea), and Goodyer (Croydon), hon. secretary. Letters of regret at their inability to be present were received from Messrs. Bruce (L.C.C.); Williams (Erith), and Stokes (Bexley Heath). Various matters of interest were discussed.

The Decimal and Metric Systems.—In continuation of the special articles on "After-War Trade," the *Board of Trade Journal* last week dealt with the questions of decimal coinage and the metric system of weights and measures. The Departmental Committee on the Engineering Trades states that:—

"There is no demand from the side of the manufacturer for the abandonment of the inch measure and pound weight and the compulsory adoption of the metric system, although some already use the latter without difficulty for their own convenience. There are also two strong reasons among others against any change at the present time: first, that the expense of the change would be so great in replacement of measuring instruments, lathe screws, &c., that the trade could not bear it at a time when its recuperative powers will be so severely taxed; and, secondly, that if the change is ever made, it should only be after consultation and agreement for identical action with our Dominions and the United States, and also, if possible, Russia.

"The foregoing remarks apply only to the inch measure and pound weight as basic measures, and not to the divisions or multiples based on them. We think it desirable that the division of the inch into one-eighth, one thirty-second, and one sixty-fourth should be abandoned altogether in favour of the division into hundredths, which is already used exclusively for high-class work.

"The hundredweight and ton should be replaced by the cental and short ton of 100 and 2,000 lb. respectively, the latter in conformity with American practice. The change would simplify invoicing and freight charges, and would be less mystifying to the foreigner.

"We would approve of a similar change in coinage if it were within our terms of reference, and provided that the pound sterling were retained as the unit of value for all purposes. We do not consider the dollar a suitable unit. The absurdity of such a complication as 73 tons 13 cwt. 3 qrs. 17 lb. at £11 17s. 6d. a ton is obvious, and great saving of time would result, both in work and education, by the adoption of decimal notation in connection with our present bases of measure and coinage."

The Committee on Shipping and Shipbuilding is not of opinion that an increase in our business with foreign clients is prevented by our insular units, in shipbuilding and marine engineering. A number of witnesses, as well as the majority of the firms, in replying to the form of inquiry addressed to them, expressed themselves in favour of the compulsory adoption of the metric system as tending to simplify calculations and facilitate business with foreign countries. But the Committee adds:—

"We have reason to think, however, that some of the firms did not clearly distinguish between the metric system and a decimal system, which could be applied equally to the English units of weight, measure, or value. The witnesses whom we consulted, while strongly in favour of making calculations in decimals, were divided on the question of introducing the metre as the unit of measurement."

As regards foreign business, clients in the British Dominions and the United States all use the British scale of linear measure; while even in other countries, the Committee was informed, there is said to be no difficulty with regard to the use of the foot and the inch. Further, this Committee urges:—

"It was pointed out to us that, apart from the inconvenience involved in the change of habit, all existing patterns, dies, jigs, gauges, &c., would be more or less useless both to designers and to the men who work to the designs. The majority of the witnesses were of opinion that this would involve considerable cost. If, in addition, a system of screw threads based on the metre were adopted, this would also include the probable scrapping of change gear wheels of lathes.

"In book-keeping and in the payment of wages, calculating machines now in use reduce the inconvenience of our monetary system, if any, to a minimum. In the works, feet, inches, and sub-divisions of inches, *i.e.*, halves, quarters, eighths, sixteenths, thirty-seconds, are used without inconvenience; and for the finer work, one-hundredths to one-thousandths of an inch are used without difficulty.

"So far as shipbuilding and marine engineering are concerned, we see no reason for the change. That part of the metric system involving the decimal sub-division of time and the right-angle is most objectionable, and if adopted would most seriously prejudice the interests of navigation."

The Committee on the Textile Trades found among individual witnesses a decided predisposition in favour of the metric system, but rather as a counsel of perfection than with a view to its immediate adoption in this country. The idea of a common system of weights and measures for the whole commercial world is very attractive, the Committee states, and it is only when the practical difficulties in the way of its adoption come to be realised that the feeling in its favour begins to cool down. In the case of the textile trades, it is added, these difficulties are very serious indeed:—

"The great British textile trades—and more particularly the cotton trade—are so predominant in the world that similar industries in other countries have had in the main to follow their lead and to accept their technical standards. All our textile machinery in this country, and in most of the countries supplied with British machinery, is based upon British measures, and, as it would be too costly to alter it, it would obviously take many years to replace it, during which period spare parts would have to be provided in the whole measurements, while all new machinery would be based upon metric measurements."

In point of fact, both exporters and manufacturers in the British textile trades, when trading with countries which use the metric system, do habitually quote in metric weights and measures, and deliver goods in these measures, whenever they are asked to do so; and it is doubtful, in the opinion of the Committee, whether any textile trade is lost either to this country or to the United States by the maintenance of the present system. The Committee, therefore, states in conclusion:—

"While agreeing that a universal system of weights and measures would be a source of great convenience and would facilitate international trade, we do not think it is practicable at the present time so far as the textile trades are concerned. If and when it does come, it can only be adopted by this country with the full concurrence and co-operation of the British Empire and the United States of America. Meanwhile, as a step in advance, we recommend the simplification of our present weights and measures and the decimalisation of our money."

Electric Power Supply in Scotland.—A conference of representatives of municipal electrical undertakings in Scotland, called to consider several important questions concerning electrical supply, was held recently at Edinburgh, under the presidency of the Lord Provost, Sir J. Lane MacLeod. It was resolved to form an Association representative of Scottish electrical undertakings, and a provisional Committee was appointed to draft a constitution for the Association.

Dr. Ferranti's Cotton-Spinning Patent.—In the King's Bench Division, on Tuesday last, Mr. Justice Sargant again had before him a petition in the matter of Letters Patent granted to Dr. S. Z. de Ferranti for improvements in relation to spinning, twisting, and doubling machinery. The case was mentioned in our issue of April 12th. In giving judgment, his Lordship said that for the last 25 or 30 years the main features of spinning or twisting had been stereotyped, and the machinery in this process had been brought to an almost inconceivable pitch of refinement and accuracy, but there were features which imposed an insuperable limit to the speed of production. The inventor, Dr. Ferranti, set to work to solve the problem of obtaining a much greater speed, and he proposed to obtain the required result by using a turbine, driven by compressed air, to rotate each separate spindle. He claimed that his invention would get rid of the difficulties which had imposed limitation on the speed of working, and, in all the circumstances of the case, his Lordship came to the conclusion that the extension of monopoly rights should be granted for seven years. With regard to the relative position of the inventor and Messrs. Coats, Ltd., under an agreement the company were to have an exclusive licence in the United Kingdom and abroad for manufacturing thread, sewing cotton, and the like, the rest of the patent remaining the property of the inventor.

Decimal Coinage.—On Wednesday, on behalf of the Association of Chambers of Commerce, Lord Southwark presented to the House of Lords a Bill for the adoption of the decimal system of coinage in this country. It is proposed that the existing silver, copper, and bronze coins should be abolished, and their places taken by coins each of which would be a "thousandth part, or the multiple of a thousandth part, in value of a sovereign."

Foreign Trade.—The March Figures.—The official returns of imports and exports during last month contain the following electrical and machinery figures :—

	March, 1918.	*Inc.* or *dec.*	3 *months*, 1918. *Inc. or dec.*
Imports.			
Electrical goods ...	66,348	− 69,046	− 165,615
Machinery	853,499	+184,709	+ 750,663
Exports.			
Electrical goods ...	111,007	−192,764	− 542,559
Machinery	1,136,051	−732,732	− 1,940,751

Fatalities.—At Tipton (Staffordshire) an adjourned inquest was held touching the death of Alfred Tearne (17), a machine hand, who was found dead while following his employment at the Midland Expanded Metal Co.'s works. On March 23rd the youth was seen clinging to a stay wire connected to a pole bearing electric power wires, and the inquiry had been adjourned for an investigation to be made by a Home Office expert to ascertain whether it were possible for the stay wire to be charged. The electrician at the works, who was recalled, stated that at the time of the occurrence the power wires were looped together by copper wire, which was afterwards tied to the pole, at a distance of 18 in. from the stay wire. Owing to the stormy weather, however, the copper wire had given way and had been replaced by string. Mr. Shephard (for the firm): It has been suggested that the insulated wires touched the stay wire? Witness: That was not so. He added that the three power wires nearest the stay wire were not coupled up at the time of the accident, the motor being in disuse. Mr. G. Scott Ram, Electrical Inspector of the Home Office, said that the number of wires on the two poles was 24; they came from a building close by, at a height of between 7 and 8 ft. from the ground, and were then looped up to insulators on the poles some 10 ft. or more higher. He first looked to see if any of the wires were in contact with the stay wire, but none was in contact. He had the string holding the wires cut away to see what position the wires would take up They did not of their own accord fall against the stay wire, but several of them were quite close to it, and could readily be made to come into contact with it by the shaking of the wires. He then made some tests on the wires to see if the insulating material was sound, and found two faulty places. He could not find that the stay wire could be charged by direct contact with any of the power wires. One of the faulty places on the wires was in a position about where the copper wire would have been, and it was quite possible that the copper wire might have been alive by leakage through faulty insulation on one of the wires at the point where it was bound round. The condition of the wires was generally bad, owing to exposure to the weather for a considerable time. If the tail end of the copper wire, or any part of it, came into contact with the stay, the latter might thus have been made "live." There was also the possibility that the youth climbed the stay and caught hold of one of the faulty parts of the cable. The jury found that the youth died from an electric shock, but that there was not sufficient evidence to indicate by what means.

Building Trades and the 12½ per Cent.—It is now announced in the Press that the Committee on Production recently considered an application for a bonus of 12½ per cent. on earnings made by various Trade Unions on behalf of building trade operatives in the employment of firms who are members of certain employers' associations. By its award the Committee grants, from the first full pay day after April 11th, a bonus of 12½ per cent. on earnings to plain time workers, and 7½ per cent. on earnings to piece workers engaged on constructional or maintenance work, such work being munitions work, carried out by employers in the building trade, whether as contractors or sub-contractors.

Methods of Testing Earth Resistance.—After a series of extended experiments on testing the resistance of earth connections, the Bureau of Standards has come to the conclusion that most of the methods commonly used do not give correct results. A direct-reading portable and fairly reliable means of testing the resistance of earth connections is found in the use of the Kohlrausch bridge method or a modification of it. A separate source of energy may be obtained from a dry cell, and two auxiliary grounds must be available. Actual practice shows that the Kohlrausch bridge method checks with the ammeter-voltameter method to within an average of 3 per cent. The error very seldom approaches 10 per cent. The present-day methods of testing used by many electric companies have been found very unreliable.—*Electrical World.*

Chief Technical Assistants' Association.—The interest shown by chief technical assistants of undertakings in the Provinces since the membership has been extended to all undertakings in the United Kingdom has so greatly exceeded that originally contemplated, that arrangements have been made to relieve the hon. secretary of this section for the time being, and Mr. Parker, chief assistant of the Croydon electricity undertaking, and vice-chairman of the Association, has kindly consented to take over the secretarial duties. It is requested that all communications from members or prospective members outside the Greater London area should be addressed to Mr. J. H. Parker, Electricity Works, Factory Lane, Croydon, Surrey.

Inquiries.—The London address of the Electrical Precipitation Co. (of London) is asked for.

Appointments Vacant.—Fitter for the Morcambe Corporation electricity works; meter inspector and tester (55s. + 12½ per cent.), draughtsman (junior) (50s. + 12½ per cent.), fireman (53s. + 12½ per cent.), switchboard attendants (40s. + 12½ per cent.), sub-station attendants (40s. + 12½ per cent.) for the Greenock Corporation electricity department; shift engineer (70s.) for the Dewsbury Corporation electricity and tramway department; car-shed superintendent (£195) for the Rawtenstall Corporation tramways; sub-station attendant (65s. 5d.) for the Dumbarton electricity works (Electricity Supply Corporation); charge engineer for the Borough of Dover electricity department. See our advertisement pages to-day.

"Safety First" and Illumination.—The London "Safety First" Council has resolved to invite the Central Lighting Authority, through the Home Secretary, to adopt a diffused, substantially uniform illumination in all districts in the Greater London area, where military exigencies and local conditions permit. It was also decided, says the *Times*, to suggest to the lighting authorities in this area that, after the war, the use of appliances should be encouraged to provide diffused street illumination in substitution for the glaring lighting which prevailed before the outbreak of war.

National Electricity Supply.—In a report on the national electricity supply scheme, prepared for the information of the Newcastle Corporation, Mr. Ernest Hatton, engineer and manager of the tramways, whilst agreeing that very great economies of coal can be effected, attacks the Report of the Coal Conservation Committee, on the grounds that the recommendations of the Report are based on misleading and inaccurate data and false premises, that an immense capital outlay would be incurred in addition to the existing investments, that the process of reorganisation would occupy a very long period of years, and that a monopoly of supply would be created, and he urges municipalities to "see to it that their interests and free expansion in the future are properly safeguarded."

Faraday House Scholarships.—On the results of the Scholarship examinations held at Faraday House Electrical Engineering College, Southampton Row, London, W.C., on the 10th, 11th, and 12th of April, the following awards have been made by the Governors of the College :—

To Horace Reginald Harbottle (King's School, Pontefract), a "Faraday" Scholarship of 50 guineas per annum, tenable for three years.

To James Scott Davidson (Penrith Grammar School), a "Maxwell" Scholarship of 50 guineas per annum, tenable for two years.

To Reginald Henry Parkinson (Central Foundation Boys' School, Finsbury), an Exhibition of 30 guineas, tenable for two years.

To Arthur Casswell Harrison (Cranleigh School), a Special Prize of 25 guineas.

Institution and Lecture Notes.—Institution of Electrical Engineers.—The following arrangements have been made for meetings of the Newcastle Local Section during May, to be held in the Mining Institute, Newcastle, at 6.45 p.m. :—

May 6th.—Informal discussion on "The Proposed Regulations for the Electrical Equipment of Ships," opened by Mr. A. P. Pyne.
May 13th.—Annual general meeting and paper by Mr. C. Turnbull on "A British Electrical Proving House."

I.E.E. Council: A New Nomination.—Mr. Thomas Roles, of Bradford, has been nominated for election as a member of Council of the Institution of Electrical Engineers by a number of Yorkshire members.

Institution of Engineers and Shipbuilders in Scotland.—Among the papers down for reading at last Tuesday's meeting at Glasgow, was one by Mr. W. B. Hird on "Electrical Ship Propulsion."

Liverpool Engineering Society.—At the annual meeting on Wednesday evening, Mr. R. Croston read a paper on "Photomicrographic Examination of Metals."

Diesel Engine Users' Association.—At the March meeting of the Association (Mr. Napier Prentice, A.I.E.E., president), the hon. secretary (Mr. Percy Still) made a general statement of the position in regard to tar oil fuel and other fuel oil supplies. Reference was made to the work carried out by the Heavy Oil Engine Fuel Committee which has been appointed by the Controller of Munitions Mineral Oil Production, and particulars were given as to the method of making application for licences to buy tar oil, arrangements for tar oil distribution, various methods of using tar oil, and the granting of priority certificates to enable parts to be obtained to adapt engines for the use of tar-oil fuel.

A discussion on the use of tar-oil fuel in Diesel engines followed, and much useful information was given by several speakers in connection with the development of various devices for burning tar oil, as well as on the subject of the varying nature of tar oils.

The subject, which is of particular importance at the present time in view of the restriction in the imports of petroleum fuel oil, is to be again discussed at the following meeting, when it is expected that further information of interest will be forthcoming.

We have received from the secretary a list of members and subscribers, with particulars of the plant under their charge, objects of the Association, &c.

Volunteer Notes.—London Army Troops Companies, Volunteer Engineers.—Headquarters: Balderton Street, Grosvenor Square, W. 1.

Orders for the week ending May 5th, 1918, by Lieut.-Colonel C. B. Clay, V.D., Commanding.

Captain of the Week.—Capt. W. D. Bentley.

Next for Duty.—Capt. E. Fleming.

Extract from *Gazette.*—County of London Engineers (L.A.T. Companies): Temporary Major C. B. Clay to be Temporary Lieut.-Colonel (March 27th, 1918).

Inspection.—The Commandant desires to congratulate all ranks upon the excellent report made by the Chief Engineer (London District) on his inspection of the Corps during Easter. He takes the opportunity of thanking the London School of Military Engineering at Esher for the instruction which has enabled them to achieve this result. He trusts all members will endeavour to obtain the recruits necessary to bring the Corps to full strength.

Drills.—All the drills as set out in the quarterly programme will take place as heretofore.

Special Notices.—The Medical Officer will attend for the examination of recruits on Thursday evening at 6.

Recruits will attend for engineering instruction with the Companies.

(By order) Macleod Yeamsley, *Capt. and Adjutant.*

Capt. Higgins, R.E., has been appointed Adjutant to the County of London Engineer Volunteers (Headquarter, Balderton Street, W. 1). Following active service in France, Capt. Higgins has been, during the past two years, Senior Instructor at the London District Royal Engineer School of Instruction at Esher, where the Engineer Volunteers have carried out practice in heavy bridging, camp arrangements, obstacles, and the use of explosives. The report of a recent official inspection stated that the standard of efficiency reached by the Corps in military engineering was very good, and was due primarily to the instruction provided at Esher, backed by the keenness and enthusiasm of all ranks.

A Projected American Ship Canal.—Dr. J. A. L. Waddell, in the *Scientific American* of March 28th, gives particulars of a proposed ship, sanitation, and power canal, connecting Lakes Erie and Ontario on the American side of the border, which will involve the construction of giant lift-locks.

The total length of the proposed ship canal is about 40 miles, and that of a proposed tributory barge canal about 12 miles. The bottom width of the former varies from 250 to 300 ft., and that of the latter is about 100 ft. The depth of the ship canal is to be 30 ft., and that of the barge canal 12 ft. The total fall between lakes is 327 ft.; of this amount 8 ft. of drop could be utilised at the head of the canal to reverse the flow of the watercourses and the main sewers in Buffalo and Tonawanda, and the remaining height of 312 ft. would be divided between two lift-locks, one of 208 ft., and the other of 104 ft. rise.

The object of the scheme is threefold:—First, to carry the largest lake vessels and barges between Lakes Erie and Ontario in the shortest time and at the least expense. Second, to divert the sewage of the adjacent cities from Lake Erie and the Niagara River, which sewage now seriously pollutes the drinking water of the communities along the banks of the latter. Third, to develop electrical energy to the amount of about 800,000 H.P. The combined heights of the three locks (320 ft.) will produce the estimated H.P. The two main power houses would be located below the lift-locks, and as close thereto as possible.

Each of the large lift-locks proposed will consist of two steel tanks. These will be 660 ft. long by 70 ft. wide (inside measurement), by 35 ft. deep, so as to contain 30 ft. of water without danger of spilling. The inner edges of the two tanks are connected by wire ropes running over a line of 56 sheaves, each 20 ft. in diameter, and each outer edge is similarly connected to a row of concrete counterweights. As the depth of the water in the tanks is to be kept constant at all times, the loads to be raised and lowered will always be counterbalanced as nearly as possible. The three piers of walls for supporting the sheaves are about 280 ft. high, and each varies in thickness from 9 ft. to 17·5 ft. The dimensions of each of the counterweight blocks in plan are 18 ft. by 10 ft., and the height would be about 50 ft. if iron used in the concrete, and considerably more if not. There are to be 28 of these counterweights carried by each of the outer walls.

The operation of the lifts would be by electricity, generated in the power houses located in their vicinity. The sheaves would be operated by racks and pinions with reduction gear between these and the motors. The latter are to be placed on top of the piers, which form a platform some 23 ft. wide by 680 ft. long.

Beneath the tanks there are to be large air buffers, capable of bringing the tank to rest from its greatest allowed speed; besides which, there would be self-acting solenoid brakes to check the velocity at the proper places. Locking apparatus would be required to hold the tanks to exact position at top and bottom of travel, and provision must necessarily be made to take care of the effect of the stretching of the wire ropes under load.

Between the gates of the canal and the adjacent gates of the tanks there would be spaces that must be made as small as possible, because the water which at times fills them must be wasted. The water at the higher level would be caught in small reservoirs at the sides of the cutting a little below the elevation of the highest level of the bottoms of the tanks, and from there it would be pumped back into the head-race. The corresponding water at the gates in the tail-race would fall into the sump of the pit, and from there it would have to be pumped out. The pumps would have to be capable not only of dealing with the water wasted at the lower gates but also the greatest amount of rainfall that could reach the said pit. The average height of the bottom of the pit would be about 60 ft. below the surface of the water in the tail-race, and the elevation of the bottom of the sump would be some 25 ft. lower than that of the lowest portion of the pit.

The higher lift-lock would require about ten minutes to raise, and the lower one about five minutes; and it would take several minutes more to raise and lower the gates. Possibly a passage through the higher lift could be made in about 20 minutes, and through the lower lift in about 15 minutes.

Water-power Developments in Canada.—At the Institution of Engineers and Shipbuilders, on March 5th, Prof. J. C. McLennan gave an exhibition and description of kinematograph films illustrative of water-power developments in Canada. He said that to-day Canada was in the midst of another development, widely spread and far-reaching in its extent—namely, the industrial development of the country. Canada was going to be a great industrial country.

The Government had instituted what was called an Advisory Council on Industrial Scientific Research, and one of the first things it did was to set aside a sum of money to enable 40 young scientists every year to undertake industrial research, and also to enable a select number, who had proved themselves by those 40 scholarships worthy of it, to have the opportunity to prosecute some industrial research that would react to the benefit of the country. Consequently there were now thoughout the country in all branches men who would be in a position shortly to take charge of great industrial works. The Government of Canada had given great attention to the development of water power, because there was in Canada to-day measured 21,000,000 H.P. of water power available. In the United States there was 28,000,000 H.P. available. Already 2,000,000 H.P. had been developed in Canada, and water power there was widely distributed.

People did not realise it, but in the Montreal district there was a larger development at the present time than existed on the Canadian side at Niagara. Within 80 miles of Winnipeg as much power could be developed as was developed just now on the Canadian side of Niagara. Within a few miles of Vancouver there was 750,000 H.P. available. He held that the foundation of Canada's greatness was tied up with this power. In Canada 200 tons a day of nitric acid was made out of nitrates brought from Chile, that could be synthesised to-day by utilising the water-power, at but a fraction of the cost at which nitrates were being brought to Canada. Money was simply being wasted on every shipload of nitrate that was brought from Chile to Canada. The Governments of Canada were controlling those water powers, and they were going to supply the power as cheaply as it could be produced, and he thought he might quite safely say that that power would be produced in Canada almost as cheaply as in any country on earth. Now that cheap power had been brought to Canadian industries it was intended to bring cheap fertilisers to the farmer. It was their aim to see that in Canada there were nitrate works established which would ensure in every province a cheap and adequate supply of nitrates.

In the first development of water power the most easily-constructed plants, such as Niagara, were laid down first; then at another stage water was stored up so as to raise the minimum flow at certain points. At the St. Maurice River, north of Grand Mere, there was a dam, very much like the Assouan dam on the Nile. At La Loutre the storage works would result in the creation of the equivalent of a lake some 3,200 sq. miles in area and about 2 ft. deep, taking the water from a drainage area of about 16,000 sq. miles. This would result in rendering available 182,000 H.P. for raising the minimum load at Grand Mere and Shawinigan.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—We tender our congratulations to Mr. R. Stewart Bain, managing director, and Mr. G. W. Partridge, engineer and manager, of the London Electric Supply Corporation, Ltd., who have recently completed 30 years' service in the company. Mr. H. C. Carter, secretary of the company, after 29 years' service, has retired owing to ill-health.

Bury Tramways Committee has received a letter from the Tramways (Board of Trade) Department, suggesting the transfer of the services of Mr. W. Clough, the Bury tramway manager, from the Shipyard Labour Department of the Admiralty to their Committee, and it has been decided to accede to the request, on the understanding that the proposed transference will enable Mr. Clough to devote more time to Bury.

Aylesbury T.C. has increased the salary of the electrical engineer to £250 a year, with a further increment to £275 as from October 1st.

The Dover Corporation tramway staff has presented a gold watch and a smoker's outfit to Mr. Goodchild, inspector, on his retirement after 20 years' service.

Mr. William Donaldson, chief traffic assistant to the Hastings Tramways Co., on leaving to take up military duties, has been presented with a silver wrist watch and a cheque by the manager and staff.

Mr. S. Hann, borough electrical engineer of Stoke Newington, is now a full lieutenant in the Army.

Mr. George Ollier, assistant electrical engineer at Bispham, Blackpool, and formerly of the Blackpool electricity works staffs, has taken up duties as resident engineeer and manager of the electricity works at St. Andrew's, Fifeshire. He served through the Gallipoli campaign with the signalling section of the Royal Naval Division.

Mr. R. Taylor, a member of the staff of the Leeds tramway

department, has been presented with a gold watch on his transfer from the Headingley depôt to the Beckett Street depôt at Leeds.

Dover T.C. has appointed Mr. Robertson, of Rawtenstall, as works superintendent and electrician at £4 10s. a week, and has increased the salary of the manager of the electricity works to £260 a year.

Malvern U.D.C. has increased the salary of Mr. S. Trow Smith, gas and electrical engineer, from £400 to £450 a year.

General.—Mr. Thos. Pratt, nominated for election at the forthcoming Chester Conference as the new president of the National Chamber of Trade, is head of the firm of Christopher Pratt & Sons, Ltd., electrical furnishers, of Bradford.

The Highways Committee of the L.C.C. has reappointed and reconstituted its Special Sub-Committee on Tramways Operation as follows:—Mr. W. H. P. Gibson, Mr. G. M. Gillett, Mr. H. H. Gordon, Mr. F. C. Harrison, Mr. D. Hazel, Mr. T. F. Hobson, Mr. H. Marks, Lieut.-Colonel E. W. Morrison-Bell, and Mr. W. J. Squires, together with the *ex-officio* members.

Mr. C. Jones, M.I.E.E., has been elected for the third year, president of the Warwick and South Staffordshire Branch of the Association of Mining Electrical Engineers. He was recently appointed consulting engineer to Coombs Wood Colliery Co., Halesowen.

A medal has been awarded by the Government to Frank Osman, of King's Norton, Birmingham, for devotion to duty, initiative, and resource in dealing with the erection of special plant and the maintenance of the electrical installation at a works manufacturing fuses.

Roll of Honour.—Mr. Alfred Edward Nixon, late Leeds manager of the E.G.S. Co., Ltd., of Newcastle-on-Tyne, was killed in action on April 1st. He had been with the firm 16 years, rising from boy to the position he held on joining the Army. He was well known and respected in the Northern Counties. Mr. Nixon joined the Motor Transport, and from there he was transferred into the Dorsets.

Ernest Hall, R.F.C., late electrician employed at Messrs. Harland & Wolf, of Belfast, was killed in an aeroplane accident at Lahore, India, recently.

Capt. Leonard Pickering, R.E., killed in action, was engaged in the test department of Messrs. Dick, Kerr & Co., Ltd., Preston.

Capt. W. K. Armstrong, South Lancashire Regiment, killed on April 11th, was, before the war, a student pupil at the British Westinghouse Co., Ltd., Trafford Park.

Private J. Hopkinson, Sherwood Foresters, reported missing, was in the electrical engineering department of Messrs. Robinson, Brampton, Chesterfield. His brother, Private H. Hopkinson, R.W. Kent Regiment, who was in the same department, is wounded.

Rifleman C. Coulling, who was with Callender's Cable and Construction Co., Ltd., of Erith, has fallen in action.

Private Wm. Carter, Rifle Brigade, who has died of wounds, joined up from the works of the South Metropolitan E.L. Co.

Private C. S. Jefferis, Royal Fusiliers, who has fallen in action, was with Johnson & Phillips, Ltd., Charlton.

Lance-Corporal Wm. Lewis, Notts and Derbyshire Regiment, killed in action, was with Messrs. Taylor, Tunnicliffe & Co., of Handley.

Sergeant J. Feist, Queen's R.W. Surrey Regiment, who has been awarded the Belgian Croix de Guerre for valour, was up to the outbreak of war engaged with the Guildford Electricity Co.

Lance-Corporal A. B. Hutchinson, R.E. (Wireless Section), has fallen in action. Before joining up he was an electrical engineer on the staff of the Leeds Corporation electricity works.

Corporal W. A. Leman, R.E., killed in action, was employed at the Salford Corporation electricity works.

Lance-Corporal H. Wallword, R.E., killed, was employed by the Lancashire Dynamo and Motor Co., Ltd., of Trafford Park.

Lance-Corporal Thomas Dene, Lancs. Fusiliers, who has died of wounds, was employed by Messrs. I. Frankenburg & Co., Ltd., Salford.

Private H. Wade, Manchester Regiment, who has died of wounds, was employed by Messrs. Charles Macintosh & Co., Ltd., Manchester.

Mr. L. G. Byng (Grenadier Guards), a director of the General Electric Co., Ltd., and son of the late G. Byng, chairman of the same company, has been awarded the Military Cross during the recent battles on the Western Front.

Second-Lieut. S. B. Westwood (21), Loyal Lancashire Regiment, who has been killed in action, was a member of the staff of the General Electric Co., Ltd., Birmingham.

Co. Sergeant-Major Kellock, a motorman on the Glasgow Corporation tramways, has been awarded the D.C.M. for gallant conduct.

Lance-Corporal A. B. Hutchinson, formerly an electrical engineer at the Leeds Corporation electricity works, has been killed in action.

Second-Lieut. Douglas Ray Dilworth-Harrison, who has been killed, aged 34, was an electrical engineer at Paisley, and before that first engineer on one of the Prince Line steamers.

Obituary.—Mr. R. W. Blackwell.—The following letter has been received:—

"I was deeply grieved to hear of the loss the profession has sustained by the death of Mr. Robert W. Blackwell, and noted with pleasure your appreciative obituary notice testifying to his qualities. I trust that you will allow me to supplement your remarks by a few from one who thoroughly appreciated deceased's kindly treatment of strangers in a strange land.

"My lucky star must certainly have been in the ascendant when I had the good fortune to make the acquaintance of Mr. Blackwell and his brothers, early in 1888, in Allegheny, Pa. These gentlemen were then responsible for the electrical running of the four-mile Observatory Hill Passenger Railway in Allegheny, on which later I spent many happy days and anxious nights.

"This line was a combination of the Bentley-Knight conduit and two-wire overhead systems. The conduit trough in the centre of the track was of wood, with lead and return conductors fixed on opposite sides. The spring contact shoes of the collecting ploughs rubbed along the top edges of these copper conductors.

"The overhead section consisted of lead and return conductors supported by bracket arms on wooden poles on one side of the track, one conductor above the other. The two-wheeled trolley hung on these wires, and trailed from the hood of the single-deck car, being provided with a device which released it if an obstruction was met. On the single-track section, the conductors on the cars exchanged trolleys when passing each other at the turnouts. Wood insulation was used in both conduit and overhead sections. There was no earth return. The change-over from conduit to overhead was made at the top of a 9½ per cent. grade.

"In working this early attempt at an electric street railway, many initial difficulties were experienced and duly overcome. As the two motors on each car were unprotected, one source of trouble can easily be imagined.

"In spite of many set-backs, the three brothers (familiarly known as Bob, Joe, and Frank) retained their optimistic belief in electricity as the best agent for street car propulsion; and, what was better, proved it. A small colony of English mechanics from the North-Eastern Railway Co.'s shops at Darlington, Durham, in addition to myself, have good cause to remember the broad-mindedness and generosity of Bob Blackwell and his brothers; we personally would have done anything for them, and the lapse of 30 years has, I know, not dimmed our respect and appreciation of American gentlemen, for whom it was a pleasure to work.

"Bob Blackwell was, we found, a man of his word, and one ever ready to help and advise those lucky enough to come to him. In having compatriots of men of this type as Allies in the present great struggle, the British nation is indeed fortunate.

"Gus. C. Lundberg, M.I.E.E.

The many friends of Lieut.-Col. Hurlbatt will regret to learn that he was killed in action on March 25th. For some years before the war Mr. Hurlbatt had charge of Messrs. Dick, Kerr & Co.'s interests in Manchester, and his charming personality gained for

Photo by] [Langfier, Ltd.

Lieut.-Col. Hurlbatt—Killed in Action.

him a wide circle of friends and acquaintances. At the outbreak of war he obtained a commission as second lieutenant in the Manchester Regiment, and by his meritorious service had reached the rank of lieutenant-colonel in the same regiment.

Prof. J. Puluj.—The death is reported from Prague, at the age of 73 years, of Prof. Johann Puluj. The deceased, who was a Ruthenian by birth, was formerly Professor of Electrotechnics at the German Technical High School of Prague. He was also an authority on arc lamps and carbons therefor, and the inventor of a lamp bearing his name.

Mr. James W. Garside, electrical engineer to Hebden Bridge District Council died last week. He went to Hebden Bridge from Hull in 1903, when the Hebden Bridge works were established. He was about 50 years of age.

NEW COMPANIES REGISTERED.

Basford Engineering Co., Ltd. (150,176).—Private company. Registered April 17th. Capital, £3,000 in £1 shares. Mechanical and electrical engineers, boilermakers, brewers' merchants, &c. The subscribers (each with one share) are:—Mrs. A. P. Simon, 26, Zoltta Road, Nottingham; H. R. Hilton, 1, St. Peter's Church Walk, Nottingham, chartered accountant. The first directors are to be appointed by the subscribers. Solicitors: Acton and Marriott, King Street, Nottingham.

Wicks & Dale, Ltd. (150,174).—Private company. Registered April 16th. Capital, £3,000 in £1 shares. To carry on the business of manufacturers of metal tubes, pipes, and appliances, &c. Agreement with B. W. Wicks and H. L. Dale. The subscribers (each with one share) are:—B. W. Wicks, 60, Queen Victoria Street, E.C. 4, engineer and merchant; H. L. Dale, 60, Queen Victoria Street, E.C., engineer and merchant. The first directors are: B. W. Wicks and H. L. Dale. Registered office: 60, Queen Victoria Street, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Duncan Stewart & Co., Ltd.—Bond of cash credit and disposition in security (in Scotch form), to secure £120,000, charged on the London Road Ironworks, Glasgow, and adjacent subjects. Holder: Minister of Munitions.

Evans, O'Donnell & Co., Ltd.—Memorandum of satisfaction to the extent of £3,000 on December 31st, 1917, of trust deed dated December 29th, 1900, and supplemental to trust deed dated June 20th, 1916, securing £40,000 debenture stock.

Lancashire United Tramways, Ltd. (87,044).—Capital, £200,000 in £1 shares. Return dated March 13th, 1918. 192,878 shares taken up; £7 paid; £193,871 considered as paid. Mortgages and charges, £546,500 (a further £30,000 of this stock has been deposited as security for possible advances). Deferred debenture stocks, having no charge over the company's assets, £83,330.

Howard Asphalt Troughing Co., Ltd. (69,270).—Capital, £20,000 in 19,000 ord. and 1,000 def. shares of £1 each. 5,007 ord. and 1,000 def. shares taken up; £4,007 paid; £2,000 considered as paid. Mortgages and charges: Nil.

CITY NOTES.

W. T. Henley's Telegraph Works Co., Ltd.

The annual meeting was held on Friday last at the offices, Blomfield Street, E.C. Mr. George Sutton, chairman and managing director, presided, and, before proceeding to deal with the accounts, he referred to the change which had placed him in the position of chairman. It must be unusual for a retiring chairman who had served a company for over 30 years to be succeeded by one who had gone through the offices of secretary, manager, and managing director as he (Mr. Sutton) had. He could not say all he would like with regard to the value of Mr. Gedge's services to the company during the 30 years in which he had acted as chairman, but he was sure they were all glad of the consciousness he must have that he was relinquishing the chairmanship at a time when the business was on the flowing tide of prosperity. Proceeding to deal with the balance sheet, it would be noticed that the creditors had increased over last year by about £200,000. That was due principally to the provision for special taxation for the year; to some extent to the increased turnover of the business—which was the largest turnover in the history of the company; and to a small extent for increased contingent reserves consequent upon the larger turnover. On the credit side the item of freehold land, buildings, machinery and plant was lower than in the previous year by about £40,000, which was due to the fact that they had been precluded from putting up buildings and extending their machinery and plant during the war, except so far as they had been able to do it for national work. The investments outside the business had considerably increased, entirely due to Government issues which they had taken up. A year ago they held £100,000 in Government issues and war loans; the present figure was roundly £400,000. The directors felt sure that the policy they had adopted of putting all the available resources of the company in the way of cash into Government loans would have the approval of the shareholders. Since the accounts were made up they had invested another £50,000 in war bonds, and they had also taken up a considerable number of Treasury bills. Stocks were down by about £50,000; the actual depletion of commercial stocks was very much greater, but the figure had been brought up somewhat by the large stocks of raw material they had had to hold for Government orders. Coming to the profit and loss account, the depreciation on machinery, £66,000, was a larger sum than had ever been put to that account before, and was due to the extra machinery which they had had to put in for Government requirements, the use of a great deal of which after the war was problematical. On the debit side of the account the income-tax was shown as £28,000, but that did not represent the whole amount which they paid. They must add to it the amount of tax deducted from the dividends, which amounted, roughly, to £16,000, which would make their total income-tax payments £44,000. The profit for the year was £162,867, and if the recommendation as to dividend, &c., were agreed to it would leave £112,000 to be carried forward into the new year, after making all reasonable provisions for contingencies and special taxation. Looking to the progress of the company before the year 1914, in his view the profit which they showed on the present occasion was no larger than it would have been had there been no war and they had had no war work. The commercial progress which the company was making up to 1914 had been stopped by the war. They hoped to regain it. They had an experienced staff, and he thought it could be said that they had as good a chance of regaining their commercial supremacy in the trade as any other industry in the country. If there had been no war, and they had made the profits, they would have had large sums at their disposal for development and extension of the business. The volume of trade after the war was uncertain; the board had their own views about it. For a time there might be a slackness in trade, but whether that would be so or not they knew that the means of output by the industry generally had enormously increased, and it might well be that after the war they might find that the increased means of output might be greater than the increased trade which eventually would come. In dealing with the question of profits, they would forgive him if he referred to the offer which they made to the Government at the outbreak of the war. They then offered to place all the resources of the company at the service of the Government, leaving the amount of payment and profit entirely at their discretion. He repeated that offer to-day, because he wanted to emphasise the fact that they were not "profiteers" in the bad sense of the word. Of course, a trader was in trade for the purpose of making profits. The percentage of his profits in relation to his turnover depended upon his power to sell, and he had to so regulate his profits that he did not decrease his sales. If his profits were too high, inevitably his sales would go down. The point he (the speaker) wanted to make was that the average rate of profit on the turnover during the war in the business was lower than it was in the few years prior to the war, and that, he thought, was convincing proof that in no sense could they be called profiteers. They knew that after the war the increase in taxation must be very heavy, but they must suppose that the Government would be careful how far they burdened industry in that way. Some of them would have no objection if all excess profits made during the war were taken by the State, but after the war, when they had to meet competition and to fight the world for trade, if undue burdens were to be put upon our industries their prosperity was bound to be adversely affected. The undivided profits of their business—and there had been very large profits undivided—had been used for the building and equipment of new factories employing large numbers of hands. The two new factories at Gravesend had been constructed entirely out of undivided profits. Capital and Labour alike were concerned after the war that no undue burden in the way of taxation was put directly upon industry. He had no inclination to criticise the control which the Government exercised over business, and they knew that a certain measure of control would be exercised after the war, but he was sure all business people were glad that the President of the Board of Trade had said that he could not conceive of anyone desiring in the national interests that the industrial interests of the country should be controlled a day longer than was necessary. They felt that themselves. He would like personally to testify to the whole-hearted way in which the workpeople at the factories and the commercial staff had devoted themselves to the national interests during this time of trial. Nearly 1,000 men had left the works and had gone into either the Army or the Navy, and their positions were all open for them when they came back. Concerning those who never came back, he was sure he could say that the company, when the time came, would sanction the establishment of some sort of memorial to show the deep obligation they were under to those men who had given their all for the country. He would like to give them a few figures showing the relationship between wages, taxation, and dividends in the company. During 1917 the wages they paid came to just over £200,000; the taxation came to about the same; the dividends paid amounted to £59,000, and the capital employed was about one and a half million. Those were very interesting figures, and he thought they showed that capital was not being paid an undue proportion of the amount which the business was earning. Coming to the special resolutions, he need not trouble them very much with details, as the matter had been put before the shareholders in the form of a circular. The proposal was a very simple one. They had had undivided profits which they had used in trading on behalf of the shareholders, and they had been successful in that trading. They now proposed to create 200,000 more ordinary shares and distribute them among the shareholders, giving them one new share for every new share which they held, and they could do that without in any way injuring the financial strength of the company. At the same time they were dividing the £5 ordinary share into five shares of £1 each. He did not know of any advantage in doing that except that it gave a freer market for the buying and selling of the shares. They were asking them to pass resolutions

for that purpose, and also for the incorporation of the company's tire department as a separate company. That morning their solicitor had informed him that the Treasury had refused to give their sanction to the latter proposal. He (the chairman) did not know the grounds of the refusal; he could not understand how there could be any grounds for it, as they were not asking for any money. The Tire Co. was started out of the resources of the company as a department of the business. It had established a very good reputation for the quality of its work. It had its own works alongside those of the company at Gravesend, it had its own general business manager, its own works manager, and it kept its own accounts. It was a separate undertaking, but the Cable Co. had fathered it during the three or four years of its existence. Its reputation was such that he knew officially, from a Government Department, that its solid tires, which had been used in France and elsewhere, were second to no other tires made by British or foreign manufacturers. They expected to make a great business of that tire department. If it was well managed it would, he believed, become a bigger business than the cable business, but to enable them to work it properly without friction they were determined to make it into a separate undertaking, still controlled by the company. They would make an effort to get the refusal of the Treasury set aside, but even if they could not do so, they would run the business exactly the same as if it were a separate company, and, therefore, they intended to proceed with the resolution of which they had given notice.

Mr. Sydney Gedge, M.A., seconded the resolution. He remarked that he no longer occupied the position of chairman, and that was because he was satisfied that the best interests of the company would be served by having an experienced and able man like Mr. Sutton in that capacity. When he (Mr. Gedge) resigned, he suggested that Mr. Sutton should take his place, and he was sure that if he had not made such a proposition it would have come from all the other members of the board. In 1910, as chairman, it was his pleasure to present Mr. Sutton with his portrait and a fine service of plate, and he well remembered that, in returning thanks for the presentation, Mr. Sutton told them of the great benefit which the company had been not only to the shareholders, directors, and customers, but to the large number of those whom it employed. He also told them that up to that date in the course of 19 or 20 years it had earned dividends amounting to half a million. In the 10 years since they had paid nearly an equal amount as in the first 20 years, and this year the dividend was 25 per cent., against the modest 5 per cent. with which they started in 1891. Those figures showed the great prosperity which the company had enjoyed during the long time he (Mr. Gedge) had the honour of being its chairman. The thing that had struck him in the general management of the company was that there had never been anything in the slightest degree approaching to a "job" in connection with it. Although he had ceased to be chairman, he would still continue to serve it to the best of his ability as a director.

The report was adopted.

The Chairman formally proposed the special resolutions to which he referred in his speech, and they were seconded by Mr. A. M. J. Drysdale, and carried unanimously.

German Companies.

The board of the *C. Lorenz A.G., of Berlin* (telegraph works), recommend the payment for 1917 of a dividend at the rate of 35 per cent., as in the preceding year, and an increase in the share capital from £225,000 to £337,000.

The A.G. Mix & Genest, of Berlin, after allocating £13,000 to depreciation in 1917, as compared with £39,000 in the preceding year, reports net profits of £76,000, as against £86,000. It is intended to pay a dividend of 15 per cent., this contrasting with 18 per cent. in 1916.

The Kabelwerk Wilhelminenhof A.G., of Berlin, whose share capital of £50,000 is held by the Felten & Guilleaume Co., realised net profits of £12,500 in 1917, as against £13,700 in the previous 12 months, when a dividend at the rate of 20 per cent. was distributed.

The accounts of the *Elektro-Nitrum A.G., of Rhina (Baden)*, which is associated with the A.E.G. and the Griesheim-Elektron Chemical Works, show that after applying £71,000 to depreciation in 1917, as against £2,300 in 1916, the debit balance of £25,000 brought forward has been increased to £28,000 on a share capital of £150,000.

The report of the *Kabelwerk Duisburg* states that the undertaking was occupied on national services in 1917, as in the two preceding years. After setting aside £6,000 for depreciation, as against £5,000 in 1916, the accounts show net profits amounting to £80,000, as contrasted with £74,000, and a dividend and bonus totalling 25 per cent. on the share capital of £150,000 has been declared, being the same as in the previous year.

The directors of the *Deutsche Kabelwerke, of Berlin-Lichtenberg*, merely state in their report that the works were well occupied in 1917. After allocating £1,600 to depreciation, as compared with £1,500 in 1916, the net profits are returned at £45,000, as against £31,000, and the dividend is at the rate of 10 per cent. on share capital of £262,000, this comparing with 8 per cent in the previous year.

The Grosse Berliner Strassen Bahn A.G. (Berlin Grand Tramways Co.) reports that the passenger traffic in 1917 increased by 24.4 per cent. over the previous year. The receipts expanded by 23.87 per cent., but, on the other hand, the expenses advanced by 27.29 per cent., and the excessive wear and tear of track and rolling stock rendered exceptional provision for reserves necessary. The amount set aside for depreciation is £44,000, as against £42,000 in 1916, and £440,000 has been placed to the renewal funds, as compared with £320,000 in the previous year. As net profits the accounts indicate a total of £211,000, as against £212,000, and the dividend is 4 per cent. on share capital of £5,040,000, being the same rate as in 1916.

The directors of the *Gesellschaft fur Elektrische Hoch und Untergrund Bahnen, of Berlin* (Berlin Elevated and Underground Railway Co.), report that the passenger traffic increased from 78,700,000 in 1916 to 108,370,000 persons in 1917, which was much greater than in any peace year. It is considered, however, that this exceptional expansion is transitory, as it was mainly due to the scarcity of omnibuses, motor cars, and horsed vehicles. Although the traffic receipts experienced a large augmentation, the working expenses also advanced, whilst at the same time a large sum had to be set aside for subsequent maintenance and renewal charges, the final result being that the year's working was only slightly better than in 1916. The gross profits amount to £485,000, as compared with £367,000 in 1916, and the net profits are £139,000, as against £124,000. It is proposed to pay a dividend of 3½ per cent. on the ordinary share capital of £3,000,000, as contrasted with 3 per cent. in 1916, 4 per cent. in 1915, 4½ per cent. in 1914, and 6 per cent. in each of the two preceding years. The report states that the construction of the line from the triangle to the Nollendorf Platz and the Wittenberg Platz was continued in so far as labour and materials were available.

Para Electric Railways and Lighting Co., Ltd.

Mr. F. M. Voules, presiding at the the annual meeting, said that the dividend of 7 per cent. on the ordinary shares was 1 per cent. better than for 1916. The Brazilian exchange had risen from 12d. to 12 9/16d., and at the moment there were no indications of an adverse movement. In both the tramway and lighting departments the business showed gratifying development. The number of passengers carried on the cars was well in excess of 22 millions, which was a very close approach to the record year 1912. The sale of electric current for lighting and power was 10 per cent. higher than in 1916, and the net receipts in local currency, both of the tramways and electricity departments, constituted a record in the company's history. This was largely due to further economy in operating expenses. The electrical power house, fortunately, remained quite independent of the difficulties inherent to the shipment of coal to South America, as wood was the only fuel used for power generation, with the same eminently satisfactory results already obtained for a number of years. The company had recently strengthened its position as buyers of wood in the local markets by the acquisition of a favourably situated timber estate which would yield enough wood fuel for a considerable period at a low cost to the company.

Johnson & Phillips, Ltd.—The profit on trading accounts, &c., for 1917, after making provision for bad and doubtful debts, and after charging to revenue upwards of £10,000 for maintenance of buildings, plant, &c., was £70,122, plus £18,711 brought forward. Directors', &c., remuneration required £1,888, debenture stock interest £4,949, debenture sinking fund reserve £7,951, second debenture interest £2,500, depreciation on machinery and plant, &c., £12,132, interest on loans £1,549, reserve £10,000, income-tax and excess profits duty £10,574, written off patents £2,725. The dividend paid in April last absorbed £8,750, and it is now recommended that a dividend at the rate of 7 per cent. per annum be paid on the ordinary shares, requiring £12,250, leaving £13,565 to be carried forward. The above transfer to reserve is in order to meet contingencies in connection with the war. Mr. W. Claude Johnson, the founder of the original business, has been appointed chairman in place of the late Mr. R. W. Blackwell.

Alderley & Wilmslow Electric Supply, Ltd.—Total lamp connections increased during 1917 from 1,133 kw. to 1,193 kw. The profit on working was £2,664, against £2,815 for 1916. After deducting £1,635 for interest on debentures and loans, and adding £1,166 brought forward, £1,200 is put to reserve, and £996 is to be carried forward.

Lymington Electric Light & Power Co., Ltd.—Captain K. Pulteney, presiding at the annual meeting, said that the increase in income was due to the efficient management of Mr. C. L. Holman, who was doing the work of both secretary and manager, and working with a reduced staff. The report, which recommended a dividend of 5 per cent. on the preference shares, was adopted.

Oldham, Ashton & Hyde Electric Tramway Co., Ltd.—Dividend of 3½ per cent. on ordinary shares, making 6 per cent. for the year.

Monte Video Telephone Co., Ltd.—An interim dividend at the rate of 6 per cent. per annum, tax free, on the ordinary shares is announced.

Neuhausen Aluminium Industry Co.—It was recently mentioned in this column that the Aluminium Industrie A.G., of Neuhausen, had decided to pay for 1917 a dividend at the rate of 20 per cent., as in each of the five preceding years, and to present to the proprietors gratis shares for £280,000 derived from profits gradually set aside for the full payment of the non-fully paid shares, thus raising the share capital to £1,680,000. The directors' report now states that the installations in France are still under sequestration, although the company was permitted, as in 1916, to provide the money necessary for the maintenance of the mining concessions. The directors complained that the French Government, although the undertaking has been recognised, it is said, by the French Courts as being a Swiss concern, has not removed the sequestration and refunded all expenses. The report mentions that the works in Germany and Austria were kept in satisfactory operation, and the sum of £20,000 had been allotted to the Swiss National Technical High School for electrochemical research work in connection with aluminium. At the recent annual meeting the chairman stated that unless unforeseen circumstances arise it will be possible to cover the entire requirements of the aluminium works in the current year from the deliveries of alumina from the Goldschmieden Chemical Works and the Martin Works.

Electro-Bleach & By-Products, Ltd.—At the annual meeting Mr. H. J. Mackinder, M.P., referring to the effect of the excess profits duty in connection with development companies which had no pre-war standing of profit earning, said that 9 per cent. upon those companies' capital sounded quite a good thing to the general public, but the latter should understand that industrial companies required, for healthy continuance and for reserve provision to meet the uncertainties of the future, a very much larger return upon their capital. For example, their undertaking had almost entirely reconstructed the equipment and mechanical power of the original Electrolytic Alkali Co. of 20 years ago, but it was still necessary to have ample provision in order to march with the scientific, mechanical, and general progress of the times. The Chancellor of the Exchequer should allow to such young and vigorous companies some adjustment with a view to getting relief from the present onerous incidence of the excess profits impost.

Bromley (Kent) Electric Light & Power Co., Ltd.—Mr. F. E. Gripper, presiding at the annual meeting, referred to the somewhat improved results of the year. There had been great difficulties to contend with, and would be even greater ones in 1918. One of the greatest was the Summer-Time Act, which made a difference of 30 per cent. in their output. There were the increased cost of coal, the large increases in wages under the Government order, and the five-sixths rationing order. They would, no doubt, have to safeguard themselves by increasing the price to the consumer, but it would be a matter for consideration whether that would be sufficient to meet the difficulties in front of them. The amount of electricity generated during the present year was practically the same as in 1913, but the expenses connected with it had been £10,300, as against only £7,800 in 1913; that meant a loss equal to 3 per cent. dividend. They were faced with a position in which another equally serious loss was probable.

Vickers, Ltd.—The directors hope that the accounts for 1915 will soon be completed, but the completion of the accounts for 1916 and 1917 must still be delayed for a considerable time. An extraordinary meeting was held yesterday to alter the articles of association so as to give more powers to the directors. It is desired to acquire, establish, or carry on any business or industry, whether manufacturing or otherwise, which may be calculated to be profitable, and to form any company or companies for acquiring any property or rights which may seem directly or indirectly calculated to benefit the company.

West India Electric Co., Ltd.—Total receipts for 1917, $287,211, an increase of $889; operating expenses $159,190, an increase of $15,125. Net profit $128,021, a decrease of $14,237. The large increase in operating expenses is entirely due to accident claims. Four quarterly dividends amounting to $40,000 were paid. Upon concreting the bases of all transmission line poles $2,471 were paid. The lighting lines were extended in Kingston, St. Andrew, and Spanish Town. In consequence of a plentiful rainfall throughout the year, the hydraulic station has been able to supply the necessary power for operating with only occasional assistance from the auxiliary steam station, therefore the coal consumption has been small.

Cuba Submarine Telegraph Co., Ltd.—The total receipts for 1917 were £72,531, and the expenses £19,293. After providing £6,567 for cable repairs and £2,702 for income-tax, there remains £43,970, plus £7,637 brought forward. £10,000 has been added to general reserve, and £2,500 to pension fund. 10 per cent., less tax, is paid on the preference for the year, and 5 per cent. and a bonus of 4s. per share, free of tax, on the ordinary, and £21,907 is carried forward, subject to any claim for excess profits duty. The several cables repaired at the above cost are now in good working order with one exception.

Madras Electric Tramways (1904), Ltd.—The gross profit for 1917 was £27,831. After debiting interest and London office expenses, making provision for the debenture stock sinking fund, and transferring £8,000 to depreciation and renewal account, £13,522 remains, plus £4,315 brought forward. After paying the preference dividend, and 8 per cent. on the ordinary shares, free of tax, £3,000 is transferred to general reserve, leaving £4,257 to carry forward, subject to excess profits duty, if any. The traffic receipts and the expenditure in Madras show an increase of 10.3 and 6.8 per cent. respectively upon 1916.

British Electric Transformer Co., Ltd.—The accounts for 1917 show a net profit of £22,665, plus £5,781 brought forward. There is to be put to reserve £7,500, and to depreciation reserve £1,500, preference dividend at 6 per cent. absorbs £4,379, 10 per cent. dividend on the ordinary shares requires £8,749, and extra remuneration to directors £1,067, leaving £5,251 to be carried forward. The Treasury having granted permission for the issue of the balance of the shares, these have recently been placed, and arrangements have been made by which shareholders may participate in the purchase.

Lancashire Dynamo & Motor Co., Ltd.—The "Financial Times" states that the company proposes to issue 50,000 new ordinary shares of £1 each at a premium of 7s. 6d., and has received the permission of the Treasury. Ordinary shareholders will be entitled to take up 45,000—nine new ones for each 20 now held—and the staff will be allowed to take up the other 5,000.

STOCKS AND SHARES.

Tuesday Evening.

The Budget was a very pleasant surprise to the Stock Exchange, which had looked for an increase in the income-tax heavier than the Chancellor proposed. Other forms of taxation do not affect to any material extent the markets for purely investment securities, but the announcement that there will be no change in the excess profits duty came as another unexpected "bonus," as one man expressed it. Markets are better, and there is a more confident tone than has been apparent for some time past. It may be that growing familiarity with the Man-Power Bill is robbing the latter of some of its apprehended features. The news from the Front also deserves credit for the happier sentiment in the Stock Exchanges throughout the country.

Cordial support is extended to the earnest recommendation of the Stock Exchange Committee that a settlement should be reached in the case of all bargains still outstanding on account of the moratorium position that was placed in cold storage after the outbreak of war. Shares carried over at the end of July, 1914, and loans on shares that have not been paid off, are still open in places, and the Committee urge that these commitments shall be closed either by the holders selling the shares, or by paying for them. Most of the holders have readily acquiesced in this sensible proposal, and before long there ought to be left nothing but the merest shadow of the financial obligations that yet remain as a legacy from 1914.

Movements in the market for home electricity shares are insignificant. Small falls have occurred in some of the London issues. Citys are ½ down, so are County of London and Charing Cross ordinary. The market in the last-named has been a poor one since the reduction of the dividend, and there has been a little selling during the past few days of the other two. With the increase in the income-tax, a few of the pre-ordinary stocks and shares, not only in this department, but in other sections round the House, have given way a trifle, though without making much difference to the nominal quotations. The manufacturing group is also quiet, and business moves sluggishly.

The Budget brought about sharp rises in several cable issues. Once more the attractions of these tax-free dividend payers are strongly emphasised. Globe ordinary, Western Telegraphs, and both the Easterns are good. Shares are more than ever difficult to buy. The rises spread to Oriental Telephones and United River Plate Telephones. Cuba Submarines are 5s. up. The company has done very well in the year just concluded, the gross earnings of £72,500 being £21,000 better than those of a year ago. The dividend on the ordinary shares is maintained at 7 per cent., and the bulk of the increased profit goes in the carry-forward, which is £14,000 up at £21,907, subject to any claim for excess profits duty. The company pays its dividends free of income-tax, and as the yield at the present price is 7½ per cent., this is equivalent to 10 per cent. on the money, allowing for tax. Manufacturing shares in this group are quiet. Callenders fell 10s. to 17, but Henleys at 19½ are 5s. up.

Mr. George Sutton made an interesting speech at Henley's meeting last week, at which he announced that the Treasury had refused its consent to the making of the tire department into a separate entity. Why this could not be done he was

unable to say, but the directors would endeavour to get the Treasury's refusal altered. The speech is worth reading in full by those who like to hear an experienced man's views concerning trade prospects after the war.

In the foreign group, Brazil Tractions have been rather more active than usual, and are a dollar better at 42. British Columbia Electric Railway preference lost a point, and Anglo-Argentine Tramways 5 per cent. debenture is 1½ down. The Mexican group is also depressed, and, while no quotable changes have occurred, the market for Mexico Tramways, Mexican Light & Power, and Monterey issues is somewhat weaker, in spite of the steady witness to better conditions which are beginning to prevail in Mexico.

The Underground group in the home railway market is heavy. Underground Electric Income Bonds have fallen 2 points to 75, while the 1s. shares are 6d. lower at 4s. 6d. The reason for the decline appears to be simply that investors are weeding out from their strong-boxes such stocks as possess a speculative flavour, having regard to the possibilities entailed by the Man-Power Bill.

Babcock & Wilcox are 1/16 lower at 3¼. British Aluminium have weakened a little. Rubber shares are quiet, despite a rally to nearly 2s. 6d. per lb. in the price of the produce. Armaments have developed greater firmness. The Chemical group remains very steady. With another big rise in tin there has come more animation, accompanied by rising prices, in the various markets connected with the metal.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1916.	Dividend 1917.	Price April 23, 1918.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	9	10	6¾	—	£7 8 0
Charing Cross Ordinary	5	4	5½	— ½	6 3 1
do. do. do. 4½ Pref.	4½	4½	3¾	—	6 18 6
Chelsea	5	5	5	—	8 6 8
City of London	8	8	12½	— ¼	6 10 8
do. do. 6 per cent. Pref.	6	6	9¼	—	6 0 4
County of London	7	7	10½	— ½	6 13 4
do. 6 per cent. Pref.	6	6	9¼	—	6 0 4
Kensington Ordinary	6	7	8¾	—	6 10 3
London Electric	Nil	Nil	1¼	—	Nil
do. do. 6 per cent. Pref.	4	5	6¾	—	8 0 0
Metropolitan	3	4	5¾	—	5 18 6
do. 4½ per cent. Pref.	4½	4½	6¾	—	6 13 4
St. James' and Pall Mall	8	9	7	—	6 8 4
South London	5	5	3⅓	—	7 2 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	6½	—	7 3 10
Telegraphs and Telephones.	Dividend 1915.	Dividend 1916.			
Anglo-Am. Tel. Pref.	6	6	94	—	6 7 8
do. Def.	20/6	1¼	22½	—	6 14 10
Chile Telephone	8	8	7¾	—	5 8 4
Cuba Sub. Ord.	6	7	9¾	+ ½	*7 9 7
Eastern Extension	8	8	15⅝	+ ⅛	*5 4 1
Eastern Tel. Ord.	8	8	154	+ ½	*5 4 0
Globe Tel. and T. Ord.	7	7	14⅜	+ ⅛	*4 17 5
do. Pref.	6	6	9¾	— ⅛	6 3 1
Great Northern Tel.	22	24	36	—	6 11 6
Indo-European	13	13	51½	—	6 6 3
Marconi	10	15	3⅛	+ 1/16	4 17 10
Oriental Telephone Ord.	10	10	4 1/16	—	2 10 0
United R. Plate Tel.	8	8	15⅝	+ ⅛	*5 15 4
West India and Pan.	6d.	6d.	1⅛	—	*3 6 8
Western Telegraph	7	8	15¾	+ ⅛	*5 4 1
Home Rails.					
Central London, Ord. Assented	4	4	69¼	+ 1	6 8 0
Metropolitan	1	1	26¾	— ½	4 18 9
do. District	Nil	Nil	14	—	Nil
Underground Electric Ordinary	Nil	Nil	1¼	—	Nil
do. do. "A"	Nil	Nil	4/6	—6d.	Nil
do. do. Income	6	4	75	—2	*5 6 8
Foreign Trams, &c.	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 5 per cent. Pref.	5	5	4⅞	—	5 3 1
Anglo-Arg. Trams, First Pref.	5½	5½	2⅞	—	—
do. 2nd Pref.	5½	—	2⅜	—	—
do. 5 Deb.	5	5	64	—1½	7 16 4
Brazil Tractions	4	4	42	+1	—
Bombay Electric Pref.	6	6	9½	—	6 6 4
British Columbia Elec. Ry. Pfcs.	5	5	51½	—1	9 14 2
do. do. Preferred	Nil	Nil	32½	—	Nil
do. do. Deferred	Nil	Nil	25¾	—	Nil
do. do. Deb.	4½	4½	58	—	7 6 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	31	—	Nil
do. 6 per cent. Bonds	Nil	Nil	30	—	Nil
Mexican Light Common	Nil	Nil	17½	—	Nil
do. Pref.	Nil	Nil	29	—	Nil
do. 1st Bonds	Nil	Nil	90½	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	3¼	— 1/16	4 12 4
British Aluminium Ord.	7	10	1 1/16	—9d.	6 8 0
British Insulated Ord.	17½	20	96	—	5 10 4
British Westinghouse Pref.	7½	7½	24	—	6 0 0
Callenders	20	20	17	— ½	5 17 8
do. 5 Pref.	5	5	4	—	6 5 0
Castner-Kellner	22	20	35	—	5 14 2
Edison Swan, fully paid	—	—	24	—	Nil
do. do. 4 per cent. Deb.	4	4	75½	—	5 6 6
Electric Construction	7½	7½	14	—	5 0 0
Gen. Elec. Pref.	6	6	109	—	5 15 8
do. Ord.	10	10	20½	—	4 18 9
Henley	25	25	19⅞	+ ½	6 6 7
do. 4½ Pref.	4½	4½	82	—	5 19 2
India-Rubber	10	10	15½	— ½	*5 8 0
Telegraph Con.	20	20	42	—	*5 18 0

*Dividends paid free of income-tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, April 24th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	..
a Ammoniac Sal	per ton	£80	£5 inc.
a Ammonia, Muriate (large crystal)	"	£75	£3 inc.
a Bisulphide of Carbon	"	£28	..
a Borax	"	£38	..
a Copper Sulphate	"	£37 10/-	..
a Potash, Chlorate	per lb.	2/6	..
a " Perchlorate	"	3/-	..
a Shellac	per cwt.	£32 10/-	..
a Sulphate of Magnesia	per ton	£15	..
a Sulphur, Sublimed Flowers	"	£35	..
a " Lump	"	£25	..
a Soda, Chlorate	per lb.	1/-	..
a " Crystals	per ton	170/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 3' to 12' basis)	per lb.	..	..
c " Tubes (solid drawn)	"	..	..
c " Wire, basis	"	..	..
c Copper Tubes (solid drawn)	"	1/7 to 1/7½	..
g " Bars (best selected)	per ton	£147	..
g " Sheet	"	£147	..
g " Rod	"	£147	..
d " (Electrolytic) Bars	"	£125	..
d " Sheets	"	£152	..
d " Wire Rods	"	£133	..
d " H.C. Wire	per lb.	1/4	¼d. inc.
f Ebonite Rod	"	3/-	..
f " Sheet	"	2/6	..
h German Silver Wire	"	2/3	..
h Gutta-percha, fine	"	6/10	..
h India-rubber, Para fine	"	3/2	1d. inc.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual.	"	£42	..
g Lead, English Pig	"	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	5d. to 8/-	..
e " " " medium	"	8/6 to 6/-	..
e " " " large	"	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/6½	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	..	..
n " Wire, Nos. 1 to 16	per lb.	4/3	1d. inc.

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Adoption Abroad of British Engineering Standards.—H.M. Government have recently been in correspondence with the British Engineering Standards Committee on the subject of the extension of the Committee's activities in foreign countries, and of certain new developments now in contemplation. Towards the above objects H.M. Government have assisted the Committee by a grant, in addition to which a considerable sum has been subscribed by the engineering industry itself.

The distribution abroad of the British Standard specifications and reports, if successful, must inevitably lead to a large extension of British trade, and the Committee has applied to H.M. Government to assist in the work of the Local Standards Committees which it is proposed to set up in various foreign countries, notably in Argentina, Brazil, Chile, China, Peru, Portugal, Spain, and Uruguay. It is desired that each Local Committee should have a president as well as a chairman, the former being the British Consular officer, or other Government representative, with some well-known British engineer resident in the country filling the office of chairman. The work of the secretary of the Local Committee will entail keeping the Committee's records, communicating with the main body in London, and circularising local engineers and purchasers, as well as the technical Press, with a view to furthering the adoption of British standards. At the same time, the Committee in London will expect to receive reports as to the extent to which British standards are finding favour in the countries concerned, and whether local conditions make it advisable to introduce any modifications which would be likely to bring about the wider adoption of these specifications abroad.

The Foreign Office have agreed that the services of H.M. Consular officers in certain specified localities shall be placed at the disposal of the Engineering Standards Committee to act in an honorary capacity as presidents of the Local Committees, in order to supervise in a general way the work it is desired to carry on, and these officers have been asked to take steps with a view to giving effect to the scheme briefly outlined above.—*Board of Trade Journal.*

Wagon Hoist.—In the description of a 35-ton wagon hoist, given in our last issue, the following errors occur:—On page 363, second line from bottom of column two, 2,000,000 kg. should read 2,000,000 kgm.², and on page 364, fig. 4, Thousands km. should read Thousands kgm., and 1·19 ft. per minute should be 1·19 ft. per second.

THE OVERSEAS DISTRIBUTION OF ENGINEERING APPLIANCES.

By LEONARD ANDREWS, M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers.)

No apology is thought to be necessary for presenting to the Institution a paper on a subject that is at the present time of very great national importance, for it is generally agreed that the continuance of Great Britain's present industrial supremacy is mainly dependent upon the standard of efficiency reached and maintained by the engineering profession and trades. Not only does the mere monetary value of engineering products in itself represent a considerable portion of this country's total export trade, but a far more potent factor in the commerce of the Empire is the indirect influence of engineering exports upon all other industries. Every modern industry is dependent for its existence upon a great variety of specialised engineering appliances. Furthermore, every big engineering achievement invariably leads to the establishment and development of numerous other industries.

Experience has shown that the country which carries out any original engineering work abroad usually secures the bulk of the subsequent trade of that country, created by the industries thus established. The British Empire owes its present industrial position to the fact that for many generations this country has been the recognised engineering workshop of the world, though in recent years Germany has made special efforts to undermine Great Britain's long-established lead. It is, therefore, a matter of the greatest national importance that British engineering industries should be fostered and developed to the fullest possible extent, and that, if necessary, State funds or credit should be applied to this purpose.

All who have visited engineering works in other countries —particularly in the United States of America and in Germany—must have been impressed by the fact that, as pure engineering craftsmen, British artisans can more than hold their own with any and all competitors, but that as an economic distributor this country has much to learn both from the United States and from Germany. Great Britain's superiority as a producer of engineering appliances is fully recognised by her competitors, and it would almost appear that both Germany and America—having recognised the strength of this country's position as a producer—decided to concentrate their attention upon improving distribution, and have thereby attained an exceedingly high state of efficiency in that particular respect.

Mere efficiency of production is, comparatively, of little value unless combined with efficiency of distribution. As many of the problems associated with overseas trade are so closely analogous to the difficulties which have been successfully overcome in distributing electrical energy, the past experiences of electrical engineers should enable them to render valuable assistance to the executive officers of the various organisations which at the present time are devoting so much attention to the improvement of British foreign trade.

The attitude of those manufacturers who cater only for trade f.o.r. their own works may be compared with that of a power-plant superintendent who only concerns himself with efficient production at the main bus-bars, and assumes that all questions relating to distribution are beyond his province; and who, moreover, considers that a reliable low-priced supply should be sufficient inducement to the consumer to make his own arrangements for the distribution and application of the service outside the generating station.

Naumann, in his "Mittel-Europa," says:—"In the last 20 years our German industries have assumed a wholly new appearance. Whilst growing they have grown into one another. Through employers' associations, buying arrangements, agreements as to prices and selling areas, a complex system of mutual attachments and dependencies has come into being. . . . This dovetailing of the individual-self into the community-self is what we are pre-eminently able to achieve. . . ."

What Germany claims to have achieved in 20 years, the British Empire has accomplished in as many months. The conversion or aggregation of many thousands of industrial factories in all parts of the Empire into one huge arsenal for the manufacture of war material is, without question, the most remarkable example of the dovetailing, or sinking, of the individual-self into the community-self that could be imagined.

The absence of competition between engineering manufacturers since the outbreak of war has been mainly, if not entirely, due to the fact that the demand for war material has been more than sufficient to keep all of the old-established works, and many new ones, fully employed. It has, indeed, been an illustration of the fact that competition is entirely controlled by the law of supply and demand. It has been demonstrated by electric power supply undertakings that demand can be created to an almost unlimited extent. Therefore, to reduce or eliminate excessive competition, demand should be developed or increased to balance available sources of supply.

There are millions of British subjects working in overseas territories for the benefit of those who prefer to stay at home, who are just as appreciative of, and equally entitled to enjoy, the comforts of modern civilisation as those who are already benefiting by these conveniences. The scope for developing a demand for modern engineering appliances in this field alone is practically unlimited.

The need for more perfect co-ordination between individual producers and between producers and distributors is now freely admitted. There are, however, considerable differences of opinion as to whether the centre of such co-ordination or control should be the State, or some private enterprise such as an association of manufacturers, or, alternatively, some independent trading association.

The objection to private enterprise control is that any such undertaking must depend for its existence upon its profit-earning capacity, and where its aims in this direction conflict with the community interests—and there are bound to be many such cases—the latter will be liable to suffer.

On the other hand, the objections to State control are:—

1. Such control would be liable to stultify individual effort, and since the entire fabric of existing British trade supremacy is the outcome of the work of individual firms and persons, it should be the first essential of any scheme of industrial reorganisation that individual effort be maintained in a state of maximum efficiency at all costs.

2. State control of any one trade or industry would entail the employment of a very large number of Government officials who would generally know much less about the subject than the principals of the firms they would be endeavouring to control. Moreover, it may be anticipated that the efficient co-ordination of the work of such numerous Government officials would prove to be a greater problem than that of co-ordinating the work of the firms to be controlled.

It appears that actual production, at least, should be left to individual effort, and should be entirely uncontrolled, though a closer co-operation between individual producers, such as is being effected by the various trade associations, and is the aim of the proposed trade parliaments, is undoubtedly to be desired. Some more direct control of distribution appears, however, to be necessary, but whether such control should be by the State or by private enterprise is still an open question. It is possible that some combination of State and private enterprise control may eventually prove to be the best solution.

The ideal to be aimed at is a subconscious co-ordination by indirect influence rather than the despotic mandatory control under defined rules and regulations usually inferred by reference to State control.

A symbolic illustration of such an ideal is afforded by the coupling in parallel of alternating-current generators where the sole controlling or co-ordinating influence is that resulting from the mere connection of the generators to common bus-bars. The generators may be of widely varying capacity, and of greatly differing speeds. They may derive their power, some from steam engines and boilers, others from gas engines, and, again, others from oil engines, or even from motors and secondary batteries. So long, however, as they are all connected to the common bus-bars, each of the several units will supply its quota of power to the demand upon such bus-bars.

To carry this analogy a little further, let it be assumed that the successful paralleling of alternators had hitherto never been achieved, and that every generator in this country was directly connected to a group of consumers whose maximum demand at any time was equivalent to the full-load capacity of the generator. Even though the efficiency of such individual units was the maximum attainable, it is obvious that the inability to take advantage of the improved plant factor, the increased diversity factor, and other economies accruing from parallel running and bulk supply, would result in a combined fuel consumption at least 100 per cent. greater than under existing conditions. Let it also be assumed that the individual unit supply service described is suddenly called upon to meet the competition of a bulk-supply undertaking able to run its generators in parallel. It will be evident that notwithstanding the established connections or goodwill of the individual supply units, the bulk-supply plant will be working under such advantageous conditions that it will rapidly capture all of the demand.

The above analogy represents the conditions under which many British manufacturers, with their individual producing units, were working prior to the war, in competition with the co-ordinated or paralleled producing units of the United States and of Germany. The distributing networks of these foreign bulk-supply undertakings were being extended rapidly in every direction, but especially in British Overseas Dominions.

Those who favour State organisation of distribution can point to an excellent example of successful indirect State co-ordination of industry in the Government Postal Service (service, not control). Here is no despotic dictatorship—no rules and regulations to control commerce, no interference with individual effort, and yet has there ever been a more potent influence upon the conduct of industry?

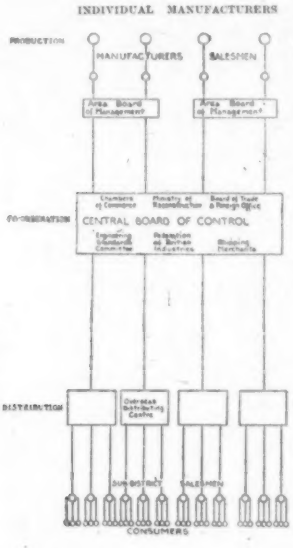
If some system of overseas trade service were inaugurated and run by the State, or by State and private enterprise combined, on the same general lines as the postal service, it should be a great boon to all industries. A service of this nature is by no means so impracticable as may at first sight appear.

It must, however, be essentially a public service, and not a trading concern, its first aim being to afford British subjects in all parts of the world facilities for procuring British-made

engineering products on satisfactory terms, and its second aim to furnish British producers with the fullest possible information respecting overseas requirements.

Notwithstanding all that has been done in the past to maintain and improve British overseas trade, there is abundant evidence that the results achieved fall very short of possible attainment. For instance, a large amount of machinery and engineering appliances of all descriptions is imported into Canada every year, but it is estimated that less than 5 per cent. of these imports are manufactured in the United Kingdom.

The author's opinion is that maximum efficiency will only be attained by grouping the various elenfents, upon which successful overseas trade is dependent, under three self-contained, closely allied, and inter-connected sections which may be classified respectively as:—(*a*) Production, (*b*) co-ordination, (*c*) distribution; the suggested co-relation and constitution of these respective sections being shown below.



Production.—The sole aim of those responsible for production should be to manufacture appliances to meet the ascertained requirements of overseas markets (f.o.r. their own works) at minimum prices consistent with reasonable manufacturing profits and a liberal scale of wages to employés. In order that producers may be free to concentrate their entire efforts upon improving the efficiency of production, it should not be necessary for them to devote their attentions to the many intricate problems associated with overseas trade. At the same time, they should be entirely untrammelled by any unnecessary restrictions in the management of their respective businesses in which they, and they alone, are experts.

Co-ordination.—There are at the present time so many organisations devoting their attention to the problems of co-ordinating and reconstructing industry—particularly the engineering trades—that it is difficult to follow and keep in touch with the various projects which are being formulated.

Co-ordination may be defined as the most efficient utilisation of all existing and potential factors of production and distribution. To ensure this, it is suggested that each of the several State and private enterprise organisations at present attacking the problems of overseas trade development from different aspects should be represented by one of its members on a central board of service, which board should be the recognised centre for all matters relating to overseas engineering trade. The primary object of this board should be:—

(*a*) To provide for adequate representation of all British engineering manufacturers in every overseas market, for which purpose city shipping merchants having established overseas branches should be utilised where possible, and distributing centres under the direct control of the central board should be organised in those overseas territories where no existing channels for British trade exist.

(*b*) To ensure that every engineering manufacturer in this country shall have an equal opportunity of competing for overseas trade, for which purpose area boards of management—such as have been employed by the Ministry of Munitions for procuring the maximum and economic production of war material—might be utilised as a decentralised purchasing agency for the large variety of engineering requirements for overseas trade.

Very complete information respecting the productive capacity of engineering works throughout the country is already in the possession of the several "Munitions Area Boards of Management" created by the Ministry of Munitions for the purpose of procuring the maximum output of war material. This decentralised system of purchasing engineering products, which has proved to be such a satisfactory method of procuring munitions on an economic basis, should be even more beneficial for the purchase of the large variety of engineering requirements for overseas trade.

Distribution.—To provide for anything approaching efficient distribution of engineering appliances, it is necessary that in every overseas industrial centre a complete distributing organisation shall be established consisting of a business general manager, an engineering staff, a number of sub-district salesmen (preferably local men well-known to every potential buyer in the particular sub-district allotted to them), an accountancy and credit department, adequate clerical assistance, warehouse and showroom or exhibition accommodation, &c.

The managers of the respective distributing centres should be men possessing tact, initiative, judgment, and resource, as well as a wide field of general knowledge. They must be given absolute authority to enter into and execute all contracts without reference to headquarters, though they should report to the central board all transactions completed each week.

The engineering staff should consist of men who have been trained in engineering works in this country, and who are consequently familiar with British workshop practice and British standards. They would advise local buyers as to the type of British-made plant best suited to their individual requirements, and would carry out contracts for the erection of complete installations where required to do so.

The sub-district salesmen (or local travellers) would be allotted separate areas to work, of such a size as to enable them to keep in touch with all buyers of engineering appliances in their respective areas. Unlike manufacturers' salesmen, who are rightly expected under all circumstances to push the sale of their own principals' products only, distribution salesmen would be required to report to the local district office all prospects for engineering work of any description. Their sole aim would be to procure the maximum possible turnover in British-made appliances without favouring the products of any individual firm.

A good and trustworthy credit department is an absolutely essential adjunct to every overseas distributing centre. The usual terms of payment in, say, Canada, are 60 days after delivery at purchasers' works, or, alternatively, part payment on delivery and the balance in instalments, frequently extended over very long periods. The local banks invariably discount purchasers' promissory notes, and make collections through their various branches when due. The principal safeguard against bad debts is an efficient credit department. Every wholesale distributor submits all important orders, before executing them, to his credit manager, who either knows or has means of ascertaining what is the financial position of every buyer, or prospective buyer, in the territory.

Any attempt to give or control credit from this side is bound to lead to heavy losses through bad debts, or, alternatively, to the loss of a large amount of profitable business.

The pricing and estimating department is possibly the most indispensable section of an overseas distributing centre. Numerous inquiries by mail and telephone, all calling for immediate attention, are received daily, and the conditions to be met are so varied that it is seldom an estimate prepared for one scheme can be used without modification for another inquiry. British manufacturers are frequently recommended to price their catalogues in the currency of the country in which they wish to do business. For engineering work this would usually be of very little, if any, value, since the cost of a plant f.o.b. English port is of no interest to the average overseas purchaser, who invariably requires the cost erected on site—say, 2,000 miles from the coast, and possibly some miles from the nearest railway siding—which cost will amount to from 150 per cent. to 300 per cent., or more, of the f.o.b. cost. Moreover, inquiries invariably call for composite tenders covering appliances made by a number of different firms. Thus a quotation for, say, a pump would usually not be considered unless it also included a petrol engine, suction-gas plant, electric motor, or other means of driving it, with switchgear, sundry pipe work, valves, tanks, &c. Performance specifications and detailed operating costs are also required with each tender.

As very few people in this country appear to have any idea of the cost of running an overseas distributing centre (manufacturers frequently suggest 5 per cent. as an adequate selling commission), the particulars of a year's costs, shown in Table I, actually incurred in one of the industrial centres of Canada, may be of general interest.

TABLE I.

Rent, rates, taxes, and insurances	£1,205
Salaries, management, engineering, and clerical ...	2,482
Salaries, salesmen, and travelling expenses ...	1,793
Packing and delivery charges	764
Office supplies, advertising, legal, and general expenses	572
Bank charges, interest, discount, and exchange ...	310
Postage, telephone, and telegrams	241
Depreciation and bed debts	396
	£7,763

Total turnover during period covered by above operating costs = £30,013.

Ratio of operating costs to turnover, 25.8 per cent.

Gross profit, £7,012 = 22.4 per cent. of turnover.

An analysis of the above charges appears to show that slightly more than half of the total expenditure is incurred on charges unaffected by turnover, but controlled mainly by the size of the area to be worked, whereas the remaining expenses are approximately proportional to the turnover.

The distributing area in which the results shown in Table I were obtained is known as the Middle West or Prairie Province of Canada. It is bounded on the east by the Great Lakes, and on the west by the Rocky Mountains, the chief centre of distribution being the city of Winnipeg. Some particulars of the developed portion of this area, given in Table II, will show how impossible it is to work such a district efficiently without incurring heavy operating expenses.

Table II.

Extreme length of district, E. and W.	...	1,300 miles.
Extreme width of district, N. and S.	...	300 miles.
Approximate area	...	160,000 sq. miles.
Total mileage of railways	...	10,000 miles.
Towns having a population of over 500	...	150
Aggregate population of above towns	...	770,000
Average population per town ...	...	5,000
Number of rural post offices ...	...	3,400

The rural post offices are chiefly mail-distributing centres for farmers, who, it must be remembered, are all potential buyers of engineering appliances, including agricultural machinery, motor cars, pumping plants, heating and lighting installations, &c.

Finance.—In endeavouring to compute what capital or financial backing would be required to carry out the overseas engineering trade service proposed, one encounters the difficulty that the engineering industry covers anything from, say, the supply of the smallest electric motor to the equipment of a bulk-supply power scheme or the building of a railway. Whilst the organisation, through its overseas distributing staff, would find many opportunities of rendering valuable assistance in connection with heavy engineering schemes, its principal source of revenue would probably be the profits on trading in general engineering merchandise of a kind that would be handled by shipping merchants.

Reference has been made to the desirability of procuring the collaboration of shipping merchants in all markets where such merchants have established distributing branches. The co-operative purchasing, and other features of the proposed central control scheme should greatly increase the previous profits and turnover of these established businesses—on the other hand, their experience, local knowledge, and trade connection should be invaluable to the central organisation. It is suggested that as an inducement to such firms to merge a portion of their increased profits in the co-operative scheme, they should be guaranteed an annual net profit equivalent to the average net profit during the three years prior to the war, and that they should retain in addition one-third of the extra profit earned each year as the result of the larger turnover, and other benefits accruing from their amalgamation with the central organisation. The remaining two-thirds of the excess profits would be applied towards meeting the expenses of the central control board.

Discussion.

Mr. Percy Griffiths, opening the discussion, congratulated both the author and the Institution on bringing this matter forward at this particular moment; our military operations were a secondary matter—our position depended upon our supremacy at sea, which was bound up with our oversea commerce. Our commercial position was of vital importance; if the war ended and found us unprepared to improve our position, we should have failed. The more efficiently we could deal with these subjects the better for us, and he specially congratulated the Institution on being the first to bring this particular subject to the front. The initiative must lie with the trade, and must not be handed over to the Government; this was an *essential* factor—any attempt to vary it would be fatal. The word "control" appeared repeatedly in the paper; he preferred "service," as any such organisation must be for the service, not the control, of the industry, and any trader would resent "control." A better expression would be "federation of trade interests." He did not agree with the author's references to the economic results of the absence of competition between manufacturers under the present system; the munitions system had been very unsatisfactory from the economic point of view, and the nation's money had been squandered. It was the only possible method to meet the emergency, but was not suitable for trade development. The financial control must be in the hands of the trade; if the Government exercised control, it must contribute to the cost in proportion to the control, but both these points should be left out of the question. He suggested that the author's scheme as a whole was complex and unwieldy; there was a gulf between individual manufacturers and consumers that would make for trouble and hinder trade. Such a scheme might be most effective in new countries, but more direct communication must be provided between maker and user. In the first instance, sales must be by catalogue, but in large work there must be direct communication. In the past manufacturers' standards had been forced upon consumers; they must be more elastic in meeting local conditions in the future, especially in foreign and new countries. Sub-district salesmen must be engineering experts—it was very important that the user should have direct access to an expert engineer.

Mr. W. L. Madgen agreed in the main with Mr. Griffiths. The alleged unwillingness of the British manufacturer to vary his standards was an argument that was popular with the halfpenny papers some years ago, when they were slating English makers, but a population of 45 millions could not make everything. Their efficiency would be improved by selecting suitable standards and pushing them vigorously. He was struck by the section marked "co-ordination" in the author's diagram; he doubted the efficiency of the composite body outlined. Such a body would become a machine to provide salaries for officials. As a large buyer of machinery, he endorsed Mr. Griffiths's remarks about expert salesmen; the buyer wanted *help* in deciding what to install.

Mr. Ll. B. Atkinson congratulated the author and the Institution on raising a subject so interesting and important—much more so than any technical matter. Mr. Andrews advocated the abandonment of individual methods; we *must* do this, or fall. He showed a slide illustrating the enormous ramifications of the A.E.G., and said that manufacturers could not cope single-handed with this huge organisation. A similar organisation existed in the United States, with immense possibilities; in the past its operations had not extended abroad, but they would do so in future. They were up against these huge combinations, and would waste their time and trouble if they did not co-ordinate their efforts. Whether the author's scheme was best or not was open to discussion, but the mention of Government control would kill it. Yet individual British engineers were reluctant to co-operate. They must be convinced that by doing so they would get more work than otherwise.

Mr. Newlands described the course of events at the opening of the war, and the formation of Area Boards of Management, leading to large production. Co-ordination was, in his opinion, the key to success, of which he was assured.

Mr. Percy Rosling differed from the author's diagnosis and from his proposed remedy. He said that if they compared like with like, the British salesman had little to learn from his foreign competitor. But *small* manufacturers must combine, and appoint their own joint representatives, as the large British firms had done. The A.E.G. had British salesmen in Australia, and so had the Americans; British staffs were preferred. If the British would refrain from helping the Germans in future, the Germans would be blown out of our Colonies. In such countries as China and S. America cheapness was the criterion. The success of the large German concerns was due to the fact that the buyer could fill his requirements from branch offices on the spot in most parts of the world, and repairs and spares were obtainable cheaply and quickly from these branch houses everywhere; there was no difficulty or delay in dealing directly with headquarters. The key to the situation was to hold our own market first, then British workmen and manufacturers could beat any country.

Mr. Selwyn Grant said that the Area Boards of Management were created by the Ministry of Munitions when their work could not be accomplished by any other means; they were enormously successful, but with widened spheres of activity difficulties cropped up. The fundamental difficulty was to distribute expert knowledge; there were too many links between the producer and the purchaser.

Mr. J. E. Kingsbury said that in considering this matter they must bear in mind what had happened in the past. The point requiring the greatest attention was the middleman. The board of control should be divided into two sections, information-getting and work-getting. It appeared to be somewhat cumbersome, perhaps due to the analogies of the Ministry of Munitions and the Post Office. The Ministry of Munitions was a despotic power, formed for one purpose, and to supply one customer only. The Post Office was also despotic, and both were monopolies. If a middle-man were introduced he would create a monopoly, but the overseas trade of the future must not, and would not, be a monopoly, and it could therefore not be managed by a Government institution.

Mr. F. Broadbent missed from the central board of control any reference to shipping and railway companies, whose co-operation was essential to success. In Germany special railway rates were quoted for export goods, whilst special export rates were given here only where the railways were in direct competition with shipping. Conference rates existed between German and English shipping companies, yet a German concern could quote lower through rates to our Colonies than any English manufacturer. He gave instances showing how British manufacturers could save by shipping *viâ* Antwerp. Preference was given to foreigners by our shipping companies; even on the *same ships*, and for shorter distances, there was 50 per cent. difference.

Mr. E. T. Williams said that it was absolutely necessary for this country to develop a tremendous output of exports. At home people did not realise the immense openings for trade abroad. After the war, "business as usual" would not serve; steps must be taken on organised and rational lines for collective action. A previous speaker had put the matter in a nutshell: "Help the trader to expert assistance, without interference with individual action." He was in full sym-

pathy with Mr. Andrews, though not necessarily in agreement with his proposed methods. They must get ready in time, and take action ere it was too late.

Mr. E. W. Cowan reminded them that someone had said the cessation of hostilities would find us as much unprepared for peace as the outbreak of war had found us unprepared for war. We must prepare beforehand, and try to realise the conditions of the future peace. As a matter of principle, as a manufacturer, he did not like the separation of production from distribution; it was best to run the business as a single machine, under the control of one mind. According to his experience, the adaptation of the views of the maker and the user could not be carried out on the lines of the author's diagram; there should be a short circuit between producer and consumer. He had been engaged in commerce with new countries, and adopted the plan of sending bulletins round to the plantations, receiving inquiries, and communicating with the manufacturer; he could not conceive of a better system.

Mr. A. H. Foyster said that purchasers were willing to buy British goods, but were driven again and again into the hands of Americans and Germans; there were many channels of information in existence, but they were not co-ordinated. The shipping merchant did not want a technical man on his staff, as this would add to his responsibility; his business was merely to buy goods and ship them as ordered. There were many difficulties and delays in the way of the purchaser in getting the stuff from home; he must go through a firm actually represented in the colony.

Capt. R. B. Slacke said that some organisation was necessary to deal with farmers, whose finance depended upon the prospect of a good harvest at some future date—no manufacturer could finance that position. The huge German organisation did not feel the financial burden, and some means must be found to remove this handicap. Could not the Councils of the Institutions of Electrical, Civil, and Mechanical Engineers combine and recommend to the Overseas Trade Advisory Committee a plan to co-ordinate the interests involved? It was of no use to discuss the details of the scheme there; they should do something to get into touch with the Committee or the Government somehow.

Mr. Harry Allcock cordially endorsed Mr. Atkinson's remarks, and said that the author had shown that the profitable expansion of our engineering trade was intimately connected with our future safety. Production was assured—our works were already enlarged; the first question that would arise after the war was "oversea distribution." Individual representation was useless; he had heard of 18 representatives in the same trade competing in one locality. The appointment of a local firm of merchants fortified with technical assistance was not favoured by manufacturers, because the merchant house got all the credit. Groups of allied non-competing manufacturers formed to share expense in particular markets were liable to break down from internal stresses. The solution that he preferred was that an association of manufacturers in a given trade should select their own representative and send him out to sell "British" goods against American or German firms. The orders would go to a central sales bureau, and thence be distributed to the allied firms. He emphatically disapproved of any State share in the organisation; the State should do all that it could to facilitate commerce, by providing direct cable communication, adopting decimal coinage and the metric system, and in other ways.

Mr. H. W. Bosworth said that the fatal objection to State control was that it was not compelled to make a profit, and was certain to result in inefficiency and endless forms to fill up. For an oversea representative to obtain orders to be allotted on competitive lines would suit neither purchaser nor manufacturer. The purchaser would not deal with a nameless firm, and the manufacturer would not care to lend his catalogues, &c., to the organisation—he would send out a representative to short-circuit the scheme. There were in this country no fewer than 45 firms making motors up to 5 h.p., and 25 making larger machines; if each firm were to specialise in a definite range of sizes, or a particular article, the results would be amazing. Five or six firms, each making one thing, could combine to secure representation abroad on an adequate scale; a series of groups of manufacturing firms would be formed in England, and these groups could co-operate with one another. Developments had already started on such lines.

Mr. R. J. Kaula did not favour so bureaucratic a scheme as the author had put forward. The markets might be subdivided between firms in similar lines. Our manufacturers were apt to overlook the necessity of finishing machinery in the *smallest details*; neglect of this caused endless trouble in distant countries, where materials and tools were unobtainable. Suitable men must be secured as foreign representatives—they must be more expert than the average branch manager at home; this was a factor of great weight in securing orders. Many men fresh from college sought positions in selling organisations because the salaries paid on the technical side were so low; if a living could be made in these lines, plenty of men would be available from the technical side to draw upon to send out with complete confidence to compete with the Germans.

In reply, Mr. Andrews claimed that most of the criticism was addressed to the details of the scheme; most of the speakers endorsed his point that *co-ordination was essential*. He would deal with the discussion in the *Journal*

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

5,953. "Elbows, &c., for electric conduits." J. Wilkie. April 8th.

5,966. "Electric switches." W. J. Howard and Reyrolle & Co. April 8th.

5,970. "Starting switches for alternating electric current motors." W. P. Hamlyn & British Thomson-Houston Co. April 8th.

5,971. "Incandescent cathode devices." British Thomson-Houston Co. (General Electric Co., U.S.A.) April 8th.

5,982. "Ignition magnetos for internal-combustion engines." E. Marelli and Co. April 8th. (Italy, April 6th, 1917.)

5,986. "Brushes for dynamo-electric machines, &c." H. J. Hinley. April 8th.

5,992. "Electromagnets having movable cores or armatures." E. C. Villiers. April 8th.

5,993. "Means for adjusting and indicating travel of machines or instruments operated by core or armature of electromagnet." E. C. Villiers. April 8th.

6,001. "Gas and electric cooking stoves, &c." C. J. Humpherson. April 9th.

6,007. "Electric cut-out." W. H. Illingworth. April 9th.

6,021. "Electro-massaging apparatus." H. Ashton. April 9th.

6,029. "Sparking plugs." Clerget Blin et Cie & P. Clerget. April 9th. (France, January 19th, 1917.)

6,038. "System of electromechanical illuminated recording winding-engine signals in coal mines." J. G. Dickson & T. A. Jones. April 9th.

6,039. "Electric furnaces." J. A. Fleming. April 9th.

6,055. "Bases for incandescent electric lamps." H. C. Gruisen & Naamlooze Vennootschap Vitrite Works. April 9th.

6,059. "Primary batteries." E. Sokal & S. Sokal. April 9th.

6,068. "Insulators for supporting electric cables." Soc. Metallurgica Italiana & H. Wade. April 9th.

6,087. "Incandescent electric lamps." J. F. Bennett, W. M. Gillott and G. S. Marple. April 10th.

6,090. "Automatic cut-outs." A. Fernandez. April 10th.

6,101. "Electrolytic treatment of ores." B. Hunt. April 10th.

6,104. "Controlling alternating-current power stations." E. P. Hollis. April 10th.

6,110. "Magneto." Sir G. Smith. April 10th.

6,131. "Process for generation of electrical energy." C. Benitez. April 10th.

6,138. "Electric switches." M. Brooks, W. Compton, J. E. Franks, A. E. Read & Walsall Hardware Manufacturing Co. April 11th.

6,146. "Electric signalling systems." H. Green. April 11th.

6,180. "Insulating materials." British Thomson-Houston Co. (General Electric Co., U.S.A.) April 11th.

6,196. "Transformation of electrical energy." C. O. J. Montelius. April 11th. (Sweden, March 24th, 1917.)

6,215. "Telephone receivers." E M. C. Tagerstedt. April 11th. (Denmark, March 31st, 1917.)

6,222. "Means for indicating in connection with electric circuits." J. Roberts. April 12th.

6,243. "Driving couplings for magneto-electric machines." C. E. Hulse and M-L Magneto Syndicate. April 12th.

6,247. "Electric pocket lamp with mechanical electric generator." A. Luzy. April 12th. (France, October 15th, 1917.)

6,255. "Photo-electric aircraft revealer." A. Orling. April 12th.

6,256. "Liquid resistances." Brush Electrical Engineering Co. April 12th.

6,257. "Electric welding apparatus." Thomson Spot Welder Co. April 12th. (U.S.A., October 8th, 1917.)

6,260. "Electric signalling apparatus." N. Turner. April 12th.

6,272. "Electric car-lighting, &c." A. Contet. April 12th. (France, May 18th, 1917.)

6,273. "Electric lighting apparatus." Benjamin Electric, Ltd. April 12th. (U.S.A., April 19th, 1917.)

6,298. "Machines for cutting bulbs of electric incandescent lamps, &c." R. S. Brownlow. April 13th.

6,307. "Electric generators and motors." L. Collette. April 13th.

6,310. "Telegraph systems." F. J. Mackenzie. April 13th.

PUBLISHED SPECIFICATIONS.

1916.

18,411. Electrodes for Searchlights. E. A. Sperry. December 22nd, 1915. (102,971.)

1917.

2,741. Electrostatic Generators. D. K. Morris. February 24th, 1917. (114,174.)

3,798. Driving Mechanism for Magnetos. Soc. Larraine des Anciens Etablissements de Dietrich et Cie de Luneville. April 3rd, 1916. (106,471.)

3,865. Electric Selectors. G. A. Betulander. March 17th, 1916. (105,332.)

4,162. Electric Cables, Flexible Conductors, and the like. J. H. Ward and H. Goldstone. March 22nd, 1917. (114,197.)

4,948. Electric Pocket Lamps. S. Biheller. April 5th, 1917. (114,215.)

5,481. Sparking Plugs for Internal-combustion Engines. F. J. Turquand. April 19th, 1917. (114,224.)

9,383. Electric Motor Control. British Thomson-Houston Co. (General Electric Co., U.S.A.) June 29th, 1917. (114,246.)

9,919. Supports for Electric Cables. J. F. Watson and Callender's Cable & Construction Co. July 10th, 1917. (114,249.)

11,034. Power-operated Electric Switches. Igranic Electric Co. (Cutler-Hammer Manufacturing Co., U.S.A.) July 31st, 1917. (114,098.)

12,127. Incandescent Electric Lampholders. P. M. R. Salles. August 23rd, 1917. (114,259.)

13,141. Incandescent Electric Lamps. J. Bilefield. September 13th, 1917. (114,266.)

13,322. Methods of Securing Attachments to Iron or Steel Plates having Hardened Surfaces. Quasi-Arc Co. & W. L. Cole. September 17th, 1917. (114,268.)

13,392. Telephone Systems. Automatic Telephone Manufacturing Co. (Automatic Electric Co., U.S.A.) September 18th, 1917. (114,269.)

13,713. Contact Rings for Dynamo and Electric Motors. Compagnie Universel Electric Rouland Freres et Cie. October 11th, 1916. (110,353.)

13,851. Combined Interrupter and Distributor for Battery Ignition Systems. G. F. Cooke, September 27th, 1917. (113,411.)